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ECONOMIC AND SOCIAL CHANGES: FACTS, TRENDS, FORECAST

A peer-reviewed scientific journal that covers issues of analysis and forecast of changes in the economy and social spheres in various countries, regions, and local territories.

The main purpose of the journal is to provide the scientific community and practitioners with an opportunity to publish socio-economic research findings, review different viewpoints on the topical issues of economic and social development, and participate in the discussion of these issues. The remit of the journal comprises development strategies of the territories, regional and sectoral economy, social development, budget revenues, streamlining expenditures, innovative economy, and economic theory.

Founder: Vologda Research Center of the Russian Academy of Sciences

Federal State Budgetary Institution of Science Vologda Research Center of the Russian Academy of Sciences (VolRC RAS), which existed as Vologda Scientific Coordinating Center of Central Economic and Mathematical Institute of RAS until March 2009, is situated on the territory of the Vologda Oblast. V.A. Ilyin, Doctor of Economics, Professor, Honored Scientist of Russia, is the permanent director of the Institute. A lot of great scientists have played an important role in the formation and the development of ISEDT RAS as a scientific institution such as: academicians D.S. Lvov, V.L. Makarov, V.I. Mayevsky, A.D. Nekipelov, Y.S. Osipov. Everything that has been done before and is being done nowadays by the personnel of the Institute, it would be impossible without the constant support of the Vologda Oblast's Government and city leaders.

The formation of the scientific personnel with an active life position, a great demand for Institute's investigation, academic community's support of the new journal published by ISEDT RAS, which combined efforts of the economic institutes of RAS in the Northwestern Federal District, and furthermore development of international ties have become the main outcomes of the last years.

MAIN RESEARCH DIRECTIONS

Due to the Resolution № 96 by the Presidium of Russian Academy of Sciences dated from March 31, 2009 VolRC RAS carries out investigations in the following fields:

- problems of economic growth, scientific basis of regional policy, sustainable development of territories and municipalities, and transformations of socio-economic space;
- regional integration into global economic and political processes, problems of economic security and competitiveness of territorial socio-economic systems;
- territorial characteristics of living standards and lifestyle, behavioral strategies and world view of different groups of the Russian society;
- development of regional socio-economic systems, implementation of new forms and methods concerning territorial organization of society and economy, development of territories' recreational area;
- socio-economic problems regarding scientific and innovative transformation activities of territories;
- elaboration of society's informatization problems, development of intellectual technologies in information territorial systems, science and education.

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In order to integrate scientific activities of the Institute's scholars into global research area, international scientific conferences are held on a regular basis; they result in cooperation agreements with different scientific establishments:

2007 – Cooperation agreement is signed with Institute of Sociology, of the National Academy of Sciences of Belarus , Center for Sociological and Marketing Investigations at the "International Institute of Humanities and Economics" (Belarus, 2008).

2008 – Memorandum of agreement is signed with Alexander's Institute at the Helsinki University (Finland, 2008).

2009 – Cooperation agreement is signed with Center for System Analysis of Strategic Investigations of NAS (Belarus, 2009).

2010 – Cooperation agreement is signed with Institute of Economics of the National Academy of Sciences of Belarus (Minsk, 2010).

2011 – Cooperation agreements are signed with National Institute of Oriental Languages and Civilizations (Paris, 2011), Institute of Business Economy at Eszterhazy Karoly College (Hungary, 2011), Republican research and production unitary enterprise "Energy Institute of NAS" (Belarus, 2011). Protocol of intentions are signed with Jiangxi Academy of Social Sciences (China, 2011), Research and Development Center for Evaluation and Socio-Economic Development and the Science Foundation of Abruzzo region (Italy, 2011).

2012 – Cooperation agreement is signed with Center for Social Research at the Dortmund Technical University (Germany, 2012).

2013 – Cooperation agreement is signed with Jiangxi Academy of Social Sciences (China, 2013).

July 2013 – The application for research performance by international consortium involving ISEDT RAS within the 7th Framework Programme of European Community.

2014 – Cooperation agreements are signed with Jiangxi Academy of Social Sciences (China, 2014), National Academy of Sciences SM TsSaiSI (Belarus, 2014). Protocols of intent are signed with the Academy of Social Sciences Jiangxi Mao Zhiyong (China, 2014), National Institute of Languages and Civilizations (France, Jean Verkey, 2014).

2015 – Protocol of intent is signed with the Academy of Social Sciences, Jiangxi Province (China, 2015). Cooperation agreement is signed with the Institute of Sociology of the National Academy of Sciences of Belarus (Belarus, 2015).

2016 – Cooperation agreements are signed with EHESS Ecole des Hautes Etudes en Sciences Sociales (Paris, France, 2016), Institute of Philosophy, Sociology and Law of NAS RA (Yerevan, Armenia, 2016), Yerevan Northern University (Armenia, 2016), Yerevan State University (Armenia, 2016). Protocols of intentions are signed with Academy of Social Sciences in province Jiangxi (China, 2016).

CONTENT

PUBLIC ADMINISTRATION EFFICIENCY

Editorial

INDUSTRIAL POLICY

REGIONAL ECONOMY

PUBLIC FINANCE

MODELING AND FORECAST OF SOCIO-ECONOMIC PROCESSES

ENVIRONMENTAL ECONOMICS

LABOR ECONOMICS

THEORETICAL ISSUES

SOCIAL DEVELOPMENT

PUBLIC OPINION MONITORING

Editorial

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Efficiency of the State's "Manual" Management. Challenges of 2020

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Abstract. The following materials logically continue the chief editor's article «Another Step toward V. Putin's "Long State"», which was published in the previous issue of the journal "Economic and Social Changes: Facts, Trends, Forecast" (no.1, 2020). Basics of a new Russian statehood, which the President has been building for the last 20 years, are tested by epidemiological and socio-economic crises, caused by COVID-19 pandemic, and the drop of oil prices. Efficiency of the state's "manual" management, which V. Putin has been implementing during all his presidential terms, is also going through challenges. The author's position on the development of the political situation in the country, based on the analysis of facts, statistical data, results of population's sociological surveys, and experts' assessments, proceeds from the fact that, in a current difficult situation, the President personally (publicly, attracting expert community and general population) get "ahead of the curve" to maintain stability and provide conditions

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for the long-term implementation of the prospective political course of the country's development. Such actions include timely initiation of the large-scale discussion and the adoption of the respective law on amending the Constitution of the Russian Federation and the provision of the ensured opportunity to continue national-oriented development course for the next 15 years at least. Thus, despite force majeure global circumstances and complicated domestic situation, the President takes steps aimed at the preservation and strengthening of the Russian statehood in the future. It once again shows the historical role of V. Putin and allows us to expect with cautious optimism the Russia's "withdrawal" from the current situation without, at least, losses for national security and competitiveness while keeping prospects for further sustainable development.

Key words: efficiency of the state's management, "deep state", pandemic, Constitution of the Russian Federation, National security strategy.

Most countries spend first months of 2020 in crisis conditions caused by a sharp escalation of the epidemiological situation due to the spread of the coronavirus infection. The pandemic, declared by the World Health Organization on March 11, 2020, is not the first such test for humanity[1]. However, its circumstances are new, complex, and unknown.

The real practice of "closing" state borders is carried out against the background of, seemingly, the only and non-alternative path of historical development – globalization. As experts note, "the measures for fighting the coronavirus pandemic generally **boil down to one thing: closure.** If we assume that the previous universal paradigm, at least in theory, was a global, liberal, market-based opened society where the ideology of human rights, meaning individual's rights regardless of citizenship, state, religion, race, or even gender, was dominant, then **the coronavirus represents an exact 180% change of humanity's dominant trend**..."[2].

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[1] For reference:

According to WHO definition, a pandemic is the worldwide spread of a new disease. **The coronavirus outbreak is the 18th pandemic in human history.**

The first pandemic is the "Plague of Justinian". In the 11–12th centuries, it engulfed the entire civilized world and claimed up to a hundred million lives. In the mid-14th century, the plague pandemic known as the "Black Death" began in China and spread to Europe. Up to 34 million people died. Also, from the beginning of the 19th century, 7 cholera pandemics have been recorded. For Russia, the deadliest was the third one which occurred in the 1850s and killed a million people.

Since the beginning of the 20th century, humanity has gone through several pandemics. The worst one – the influenza pandemic – spread in 1918–1920 and took more than 20 million lives. The "Spanish flu" was caused by H1N1 virus. It affected 20–40% of world's population.

During the pandemics of 1957 ("Asian flu") and 1968 ("Hong Kong flu"), more than 1.5 million people died, and the economic damage amounted to about 32 billion dollars. In 2002–2003, atypical pneumonia spread in several countries in South-East Asia. According to WHO, during this time, 8.436 cases of SARS were registered in 30 countries with more than 900 deaths.

In 2003–2005, H5N1 virus caused the worst outbreak of bird plague in history. According to WHO, since 2003, 389 people in 15 countries were infected with H5N1 virus, and 246 cases were lethal. In April 2009, the first cases of human infection with a new H1N1 virus (swine flu) were confirmed. More than 2.600 people died because of it.

In late December 2019, Chinese authorities reported an outbreak of pneumonia of unknown origin in Wuhan. First infected people were related to seafood market. Experts tentatively identified that the causative agent was a new type of coronavirus – 2019-nCoV. **The World Health Organization declared a new coronavirus pandemic on March 11, 2020.**

(Sources: Pandemics in the history of mankind. Reference. *Vesti.ru*, dated 12.03.2020. Available at: https://www.vesti.ru/doc.html?id=3247270; Available at: Cases of pandemics in the world in the 20th century. *RIA Novosti*, dated 12.03.2020. Available at: https://ria.ru/20200312/1568463184.html)

[2] Dugin A. An hour of pangolin has struck. *Official website of the Izborsky club*, dated 06.04.2020. Available at: https://izborsk-club.ru/19069

Table 1. Dynamics of international tourism indicators, million units

Territory	Number of arrivals						Number of departures					
	1995	2000	2010	2015	2018	2018 to 1995, %	1995	2000	2010	2015	2018	2018 to 1995, %
World	**532.95**	**689.65**	**973.77**	**1227.87**	**1441.95**	**270.6**	**604.18***	**733.38**	**1073.42**	**1336.35**	**1563.56**	**258.8**
UN countries	263.20	331.01	378.07	473.43	555.89	211.2	219.87*	268.00	337.36	369.03	445.07	202.4
East Asia and Oceania	77.68	105.03	195.02	263.42	320.27	412.3	111.03**	135.13	244.83	357.38	415.03	373.8
Latin America and the Caribbean countries	47.44	56.00	73.25	97.00	113.35	238.9	23.69	30.62	44.22	63.17	70.17	296.2
North America	60.64	71.20	76.46	95.96	101.16	166.8	69.48	80.50	89.76	106.48	118.62	169.9
For reference: Russia	***10.29***	***21.17***	***22.28***	***33.73***	***24.55***	***238.6***	***21.33***	***18.37***	***39.32***	***34.55***	***41.96***	***196.7***

Source: database of the World Bank. Available at: https://data.worldbank.org/indicator?tab=all
* Data for 1997.
** Data for 1998.

Forced self-isolation, as the most efficient current method of preventing the epidemic, is implemented on the background of a long-time global trend **of annual increase of international tourism' flow** (*Tab. 1*). According to UN World Tourism Organization, "in 2019, there were 1.5 billion worldwide tourist arrivals. **The growth of international tourism continues for the 10th year in a row… in 2019, it was recorded in all regions of the world"[4].**

In Russia, during the last 23 years in particular (from 1995 to 2018), a number of trips abroad has almost doubled (from 21 to 42 million), a number of arrivals from foreign countries increased by almost 2.5 times (from 10 to 25 million).

The global economy was simultaneously hit by a sharp drop of oil prices due to the reduction of domestic and international traffic against the background of quarantine measures and aggressive economic policy of Saudi Arabia[5].

> "Sharp decline of oil prices and the coronavirus outbreak, which became a full-fledged pandemic, reinforced each other and **put the world on the verge of a global recession.** Counteraction against the crisis is complicated by the fact that the disintegration of society, necessary for fighting the virus, exacerbates economic difficulties"[3].

[3] Ivanter A., Kudiyarov S., Obukhova E. Crisis we are ready for. *Expert*, 2020, no. 12, p. 13.

[4] Finmarket with reference to data from the UN World Tourism Organization (UNWTO). Available at: http://www.finmarket.ru/news/5153745

[5] In early March, Saudi Arabia with its ultimatum wanted to persuade OPEC countries and Russia to agree to serious cuts of oil production and exports in order to support prices against the background of the coronavirus epidemic and to consolidate its position as the world's leading oil exporter. Russia refused to consider itself a "junior partner" and did not support this plan. Then Saudi Arabia decided to increase production and sell its oil at huge discounts (Source: *Radio Svoboda*, dated 09.03.2020. Available at: https://www.svoboda.org/a/30477085.html). Nevertheless, on April 10, 2020, the heads of Russia, the United States, and Saudi Arabia still managed to reach a new agreement to reduce oil production. According to Russian Energy Minister A. Novak, it will operate for two years (until May 1, 2022), and it involves the reduction of oil production in the first two months by ten million barrels per day (Source: *RTVI news*, dated 10.04.2020. Available at: https://rtvi.com/news/peregovory-posle-vstrechi-opek/).

As a result, the world's largest publications and organizations predict a global economic recession:

✓ The World Trade Organization forecasts a drop of world trade in 2020 by more than 30%[6];

✓ according to experts of the International Monetary Fund, "the recession in 2020 will be recorded in 157 countries out of 194, including Russia ... on average, the value of global GDP will decrease by 3%"[7];

✓ according to Bloomberg, "the coronavirus pandemic is set to rob the global economy of more than 5 trillion dollars. Even with unprecedented levels of monetary and fiscal stimulus, gross domestic product is unlikely to return to its pre-crisis trend until at least 2022"[8];

✓ according to the World Bank experts, "Global growth is expected to recover to 2.5 percent in 2020 – up slightly from the post-crisis low of 2.4 percent registered last year amid weakening trade and investment. Nevertheless, downside risks predominate, including the possibility of a re-escalation of global trade tensions, sharp downturns in major economies, and financial disruptions... A steep productivity growth slowdown has been underway in emerging and developing economies since the global financial crisis, despite the largest, fastest, and most broad-based accumulation of debt since the 1970s"[9].

> "Along with globalism, the model of the world order which became the only alternative after the collapse of the USSR is falling apart. Therefore, **there is no reliable model that can be taken as a basic one in these conditions.** We know that a closed society is taking the place of an open society, but "what this society is", "what this society will be", "what this closeness means", and "what it will lead to, what it will result in", no one can answer for sure. **This is what makes our situation so critical, disastrous, and, at the same time, fascinating"**[10].

Therefore, due to the impact of the pandemic, trends of global development of the last centuries ("crisis of classical liberalism", "strengthening of the role of the national agenda in relation to the global one", "growing attention to issues of national security", "socio-economic consequences of a rapid spread of new (primarily digital) technologies", etc.[11]) sharply escalated. International organizations (WHO, UN, EU) are losing control over the situation and the efficiency of their activities is quite often criticized (in particular, WHO was criticized for the delay in the official recognition and declaration of the coronavirus pandemic, and it largely caused the lack of efficiency of quarantine measures[12];

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[6] WTO predicted a decline of world trade due to coronavirus in 2020. *RBC*, dated 08.04.2020. Available at: https://www.rbc.ru/rbcfreenews/5e8deceb9a7947336bff9535; WTO press release *"Trade set to plunge as COVID-19 pandemic upends global economy"*, dated 08.04.2020. Available at: https://www.wto.org/english/news_e/pres20_e/pr855_e.htm

[7] The IMF predicted the worst decline of global GDP since the Great depression. *RBC*, dated 14.04.2020. Available at: https://www.rbc.ru/economics/14/04/2020/5e95bi6fa9a794742620aeabc; *WORLD ECONOMIC OUTLOOK REPORTS World Economic Outlook, April 2020: Chapter 1.* Available at: https://www.imf.org/en/Publications/WEO/Issues/2020/04/14/weoi aprili 2020

[8] Bloomberg estimated the loss of the global economy from the coronavirus at $5 trillion. *RBC*, dated 09.04.2020. Available at: https://www.rbc.ru/economics/09/04/2020/5e8ec97f9a79478537a44e47; *Bllomberg official website*. Available at: https://www.rbc.ru/economics/09/04/2020/5e8ec97f9a79478537a44e47

[9] *Global Economic Prospects: Slow Growth, Policy Challenges*. The World Bank. Available at: https://www.vsemirnyjbank.org/ru/publication/global-economic-prospects#firstLink01658; *Global Economic Prospects: Slow Growth, Policy Challenges* / 2020 International Bank for Reconstruction and Development / The World Bank.

[10] Dugin A. An hour of pangolin has struck. *Official website of the Izborsky club*, dated 06.04.2020. Available at: https://izborsk-club.ru/19069

[11] Mau V.A. Economics and politics 2019–2020: Global challenges and national responses. *Voprosy Ekonomiki*, 2020, no. 3, pp. 7–11.

[12] April 7, 2020. U.S. President D. Trump wrote a message in his Twitter account heavily criticizing the World Health Organization noting that "The W.H.O. really blew it", it did not do much to prevent the epidemic in the US and payed too much attention to the situation in China. *RBC*, dated 07.04.2020. Available at: https://www.rbc.ru/politics/07/04/2020/5e8ca27c9a7947a1b70a6ec3

the EU – for self-exclusion from problems faced by its participants at the national level[13]). Some states make their own decisions concerning methods of fighting the epidemic and keep the economy, the level and quality of life of population "afloat". It contradicts basic principles of a globalized world order that prevailed throughout the post-war period.

At the national level, current relations between society and authorities, the ability of the state to efficiently organize epidemiologic measures for the coronavirus counteractions, to implement comprehensive and operative actions to support systems of healthcare, economy, business, population are all seriously challenged.

At the individual level, people's civic responsibility is tested first of all: their readiness to change their habitual way of living for a common cause – to prevent the spread of the infection and reduce workload on healthcare system – and to overcome economic and social problems that arise during quarantine measures.

Thus, the nature of the challenge, caused by this viral infection, is not only epidemiological but also civilizational (political, economic, cultural and value). It tests the viability of various levels of human life organization: the entire civilization, the efficiency of public administration at the national level, people's way of living at the individual level.

Every country that faces this challenge chooses its own tactics for conducting foreign and domestic policy to get out of this situation not only "alive" but also competitive[14].

In particular, China's experience – the first country to face the coronavirus and, therefore, the leading state in the fight with the infection – shows that **the main condition for overcoming the epidemic is a high efficiency of public administration: a clear organization of all spheres of life, mobilization and consolidation of society and government, mass readiness to adapt mutual restrictions and change the usual way of living for common interests (prevention of the infection spread). At the same time, no social outbursts should be allowed.**

China is gradually coming back to normal life: quarantine restrictions are being lifted, people go to work, visit cultural places and events, public transport is beginning to function... Some European countries (Germany, Austria, Italy, Spain, the Czech Republic, Denmark[15], etc.) are also gradually removing quarantine restrictions, but, unlike them, China is really beating a viral infection, and it is not just sacrificing the safety and health of its citizens in favor of additional opportunities to support its national economy.

[13] After the refusal of the European Union to help Italy (the most affected by the coronavirus epidemic country in Europe) and its demand for "another 15 days to decide what to do, who to help, and how to help, if to help", former Italian Deputy Prime Minister M. Salvini did not rule out the possibility of his country leaving the European Union, and he criticized the EU authorities for slowness: "A far cry from being a 'union', this is a den of snakes and jackals. First let us beat the virus, then think about Europe again. And, if necessary, say goodbye. Without even thanking it" – Salvini said to online-paper Affaritaliani.it. On March 27, Prime Minister of Italy G. Conte declined the project of the summary document regarding measures for overcoming consequences of the coronavirus pandemic during the meeting of 27 EU leaders. He gave his colleagues 10 days to find "an adequate solution, corresponding to the severity of the emergency" (Source: Salvini threatened the European Union with Italy's exit". *Izvestia*, dated 28.03.2020. Available at: https://iz.ru/992550/2020-03-28/salvini-prigrozil-vykhodom-italii-iz-evrosoiuza).

On April 2, the President of the European Commission Ursula von der Leyen apologized to Italy for the temporary lack of assistance in the fight against coronavirus from the EU (Source: The European Union apologized to Italy for the lack of assistance in the fight against coronavirus. *Lenta.ru*, dated 02.04.2020. Available at: https://lenta.ru/news/2020/04/02/sorrybae/)

[14] Most countries (including China, the United States, Russia, and others) impose a wide range of quarantine measures that affect all major groups of population. However, in the UK, for example, quarantine restrictions primarily apply to elderly population, and, in Mexico (where some areas are not controlled by the government at all), the outbreak of the infection spreads spontaneously: people mostly rely on high temperatures, at which the spread of the virus slows down.

[15] Storma Ya. "Back to life": How is Europe softening the quarantine. *Gazeta.ru*, dated 07.04.2020. Available at: https://www.gazeta.ru/social/2020/04/07/13039483.shtml

«Today, during a bacteriological war declared to all mankind, China shows wonders of resilience. A billion-and-a-half population, all its divisions: science, army, medicine, and public organizations consistently and simultaneously perform a grandiose, deadly strategic task, saving China from destruction. China has been living all these decades within a mobilization project: a powerful state, an unshakable party that is the intelligence of the nation, the regulator of all country's contradictions. **Strategic planning, the ability of a huge population to mobilize, the subordination of personal interests and whims to a common goal and task, the reliance on the state allow China to cope with a terrible epidemic among other, unprepared for this scourge peoples who are dominated by hedonism, blind consumption, thirst for pleasure, the idea of unrestrained individual freedom, the rejection of the state"**[16].

It is clearly showed by the dynamics of statistic data on the spread of the coronavirus infections in countries: in April – March 2020, a number of infected people in China increased by 2 thousand. At the same time, this number increased by 87 thousand in Italy, by 80 thousand in Germany, and by 124 thousand in Spain (*Insert 1*). The mortality rate from coronavirus in March – April 2020 in China increased from 0.2 to 0.3 per 100 thousand people. For comparison, in Italy – from 19.9 to 41.6 cases per 100 thousand people; in Spain – from 16.9 to 45; in Germany – from 1 to 6.9 (*Insert 2*).

Even though China faced the epidemic earlier that European countries and, consequently, earlier reached a "plateau" of the infection, a number of infected people in China is significantly lower than in countries of the Old World. Most importantly, a number of deaths from coronavirus (as an indicator of the spread of the infection and the ability of public administration and health system to take efficient measures to save human lives) in China is 4–5 times lower than in Italy, Spain, or the United Kingdom.

For Russia, the comprehensive crisis at the beginning of 2020 becomes a test of the efficiency of "manual" government control of the last 20 years; the ability of all government levels to be "maximally mobilized, to act in a coordinated way and, most importantly, to work in advance"[17]. It is important that the Russian Federation faces the pandemic in the middle of deep, complex, and dynamic transformations related to the President's initiatives, announced during his Address to the Federal Assembly of the Russian Federation in 2018–2020.

"Amendments to the Constitution and the transition to "breakthrough development" are separated in time, but they form a unity"[18].

The entire course of national development, which Russian President Vladimir Putin has been implementing since 1999[19], is challenged. "Deep state", which is based on special relations between society and the national leader, and the "manual" management style, implemented by V. Putin throughout all his presidential terms, are tested.

In these conditions, any supporting points aimed at stabilizing the future (in economic, political, cultural, social terms) become especially important for national security. From these positions, it should be noted that the President once again showed by an actual example what it means to "act ahead of the curve".

[16] Prokhanov A. Mobilization or death. *Zavtra*, dated 25.03.2020. Available at: http://zavtra.ru/blogs/mobilizatciya_ili_smert

[17] Materials of V. Putin's Meeting with Government members, March 17, 2020. *Official website of the President of Russia*. Available at: http://www.kremlin.ru/events/president/news/63001

[18] Skorobogatyi P. Putin creates a "deep state" in Russia (materials of an interview with political scientist, teacher of MGIMO MFA of the RF A. Zudin). *Expert*, 23.03.2020, no. 13, p. 44.

[19] We discussed the President's successive steps toward building a new Russian state in details in a previous article (Ilyin V.A., Morev M.V. Another Step toward V. Putin's "Long State". *Economic and Social Changes: Facts, Trends, Forecast,* 2020, vol. 13, no. 1, pp. 9–33).

Insert 1

Dynamics of detected cases of infection and number of deaths from the coronavirus infection by country* (abs.)

Position	Country	Population number, people**	Number of detected cases of infection				Number of deaths			
			January	February	March	April	January	February	March	April
1	USA	332639102	7	68	188172	860772	0	1	3873	44053
2	Spain	50015792	0	45	95923	219764	0	0	8464	22524
3	Italy	62402659	2	1128	105792	192994	0	29	12428	25969
4	Germany	80159662	5	79	71808	152438	0	0	775	5500
5	Great Britain	65761117	2	23	25150	143468	0	0	1789	19506
6	France	67848156	5	100	52128	121338	0	2	3523	22212
7	Turkey	82017514	0	0	13531	104912	0	0	214	2600
8	Iran	84923314	0	593	44605	88194	0	43	2898	5574
9	China	1394015977	9802	79356	82279	84325	213	2837	3309	4642
10	**Russia**	**141722205**	**2**	**2**	**2337**	**68622**	**0**	**0**	**17**	**615**
11	Brazil	211715973	0	2	5717	49492	0	0	201	3313
12	Belgium	11720716	0	1	12775	44293	0	0	705	6679
13	Canada	37694085	4	20	8521	42739	0	0	100	2197
14	Netherlands	17280397	0	6	12595	36535	0	0	1039	4289
15	Switzerland	8403994	0	18	16605	28595	0	0	433	1308
16	India	1326093247	1	3	1397	24506	0	0	35	775
17	Portugal	10302674	0	0	7443	22797	0	0	160	854
18	Ecuador	16904867	0	0	1962	22719	0	0	60	576
19	Peru	31914989	0	0	1065	20914	0	0	30	572
20	Ireland	5176569	0	1	3235	18184	0	0	71	829

* The table shows top 20 countries with the highest number of detected cases of infection as of April 25, 2020
Ranked by the number of detected cases of infection as of 25.04.2020.
Data for January, February, March – the last day of each month, for April – the latest data at the time of preparation of the material (25.04.2020).
Source: COVID-19 (2019-nCoV) Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University with references to reports of World Health Organization. Available at: https://github.com/CSSEGISandData/COVID-19
** A number of population is given according to estimations of 2020 (Source: The World Factbook. The Central Intelligence Agency. Available at: https://www.cia.gov/library/publications/resources/the-world-factbook/)

Insert 2

Dynamics of detected cases of infection and deaths from the coronavirus infection per 100 thousand people of population. (in countries with the highest number of infections)*

Position	Country	Population number, people**	Number of detected cases of infection				Number of deaths			
			January	February	March	April	January	February	March	April
1	Belgium	11720716	0.000	0.009	108.995	377.904	0.000	0.000	6.015	56.985
2	Spain	50015792	0.000	0.090	191.785	439.389	0.000	0.000	16.923	45.034
3	Italy	62402659	0.003	1.808	169.531	309.272	0.000	0.046	19.916	41.615
4	France	67848156	0.007	0.147	76.830	178.838	0.000	0.003	5.192	32.738
5	Great Britain	65761117	0.003	0.035	38.244	218.165	0.000	0.000	2.720	29.662
6	Netherlands	17280397	0.000	0.035	72.886	211.425	0.000	0.000	6.013	24.820
7	Ireland	5176569	0.000	0.019	62.493	351.275	0.000	0.000	1.372	16.014
8	Swistzerland	8403994	0.000	0.214	197.585	340.255	0.000	0.000	5.152	15.564
9	USA	332639102	0.002	0.020	56.569	258.771	0.000	0.0003	1.164	13.243
10	Portugal	10302674	0.000	0.000	72.243	221.273	0.000	0.000	1.553	8.289
11	Germany	80159662	0.006	0.099	89.581	190.168	0.000	0.000	0.967	6.861
12	Iran	84923314	0.000	0.698	52.524	103.851	0.000	0.051	3.412	6.564
13	Canada	37694085	0.011	0.053	22.606	113.384	0.000	0.000	0.265	5.829
14	Ecuador	16904867	0.000	0.000	11.606	134.393	0.000	0.000	0.355	3.407
15	Turkey	82017514	0.000	0.000	16.498	127.914	0.000	0.000	0.261	3.170
16	Peru	31914989	0.000	0.000	3.337	65.530	0.000	0.000	0.094	1.792
17	Brazil	211715973	0.000	0.001	2.700	23.377	0.000	0.000	0.095	1.565
18	**Russia**	**141722205**	**0.001**	**0.001**	**1.649**	**48.420**	**0.000**	**0.000**	**0.012**	**0.434**
19	China	1394015977	0.703	5.693	5.902	6.049	0.015	0.204	0.237	0.333
20	India	1326093247	0.0001	0.0002	0.105	1.848	0.000	0.000	0.003	0.058

* The table shows top 20 countries with the highest number of detected cases of infection as of April 25, 2020 (authors' calculations).
Ranked by the number of deaths from coronavirus infection (per 100 thousand people) as of 25.04.2020.
Data for January, February, March – the last day of each month, for April – the latest data at the time of preparation of the material (25.04.2020).
Source: COVID-19 (2019-nCoV) Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University with references to reports of World Health Organization. Available at: https://github.com/CSSEGISandData/COVID-19
** A number of population is given according to estimations of 2020 (Source: The World Factbook. The Central Intelligence Agency. Available at: https://www.cia.gov/library/publications/resources/the-world-factbook/)

Let us remind that the first case of coronavirus infection in the world was recorded on November 17, 2019[20]. Perhaps, it caused the President's unusually early Address to the Federal Assembly. He, of course, understood that "Russia, due to its geographical location, cannot isolate itself from this threat. There are states near our borders that have already been seriously affected by the epidemic, and it is objectively impossible to completely block its penetration into our country"[21].

«World, indeed, changes very fast. The significance of state unity foundations only increases. Social obligations of the state are related to it. **These amendments constitutionalize a social state... And it is not necessary to oppose "social" amendments to "political" ones. Conceptually, it is a single entity**[22].

The nature of constitutional amendments, securing principles of a "social state", the priority of national interests over international ones, making a real step toward the nationalization of ruling elites, together with wide involvement of society in the discussion on amendments and the idea of all-Russian voting as a final authority of implementing it, allowed uniting and mobilizing society in the period of a serious crisis caused by the coronavirus pandemic.

It is unknown, how a large-scale discussion on constitutional amendments would go if it had not been announced earlier – before the country faced the coronavirus epidemic and its socio-economic consequences. Most likely, the political situation in the country would be much less stable if the President was in a "lame duck" situation today; if he did not timely "remove" unnecessary questions about the transit of power by initiating amendments to the main law.

However, currently, at the peak of the epidemic, the political situation in Russia seems quite stable. Issues related to the transit of power in 2024 were, in fact, removed from the current agenda; society highly evaluates the efficiency of measures conducted by the President and government to protect people, and it follows quarantine regulations of the authorities in a fairly organized manner. Even

According to VCIOM:

- ✓ more than 60% of Russians are certain that "Russian authorities (epidemiological and medical services) will protect population from the coronavirus spread" (32% of population share an opposite opinion)[23].
- ✓ 60% of citizens think that Russian authorities take "sufficient" measures to prevent the coronavirus spread (26% of population share an opposite opinion)[24];
- ✓ 80% of Russians stopped to go out and walk or started to do it less often in the last two weeks;
- ✓ 84% – limited their contacts with friends, 69% – with elderly relatives;
- ✓ 76% – stopped leaving a house to go to stores or pharmacy[25];
- ✓ 81% of people, assessing the behavior of their friends, relatives, acquaintances, say that "most of them keep self-isolation"[26].

[20] The first two cases of coronavirus infection in Russia were recorded on January 31, 2020 in Zabaykalsky Krai and the Tyumen Oblast.

[21] Putin V.V. First Address to the Nation concerning the coronavirus situation (March 25, 2020). *Official website of the President of Russia*. Available at: http://www.kremlin.ru/events/president/news/63061

[22] Skorobogatyi P. Putin creates a "deep state" in Russia (materials of an interview with political scientist, teacher of MGIMO MFA of the RF A. Zudin). *Expert*, 23.03.2020, no. 13, p. 44.

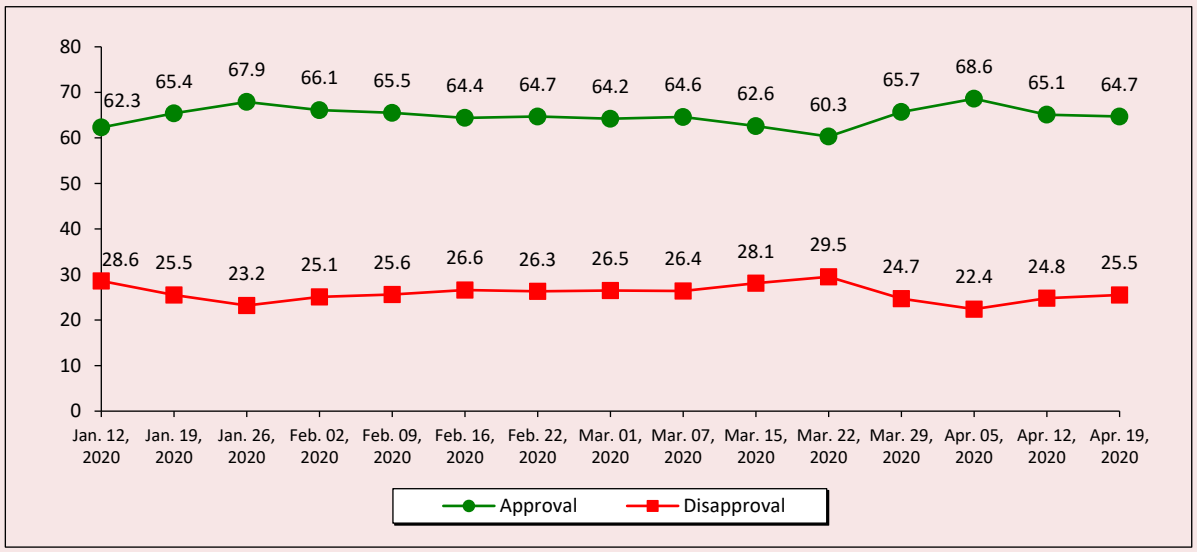
[23] And again on the coronavirus: What do Russians think? *VCIOM survey*, March 13.

[24] Russia in the pandemic: Assessing the efficiency of anti-epidemic measures. *VCIOM survey*, April 2.

[25] Coronavirus changes daily routine of Russians. *VCIOM survey*, April 2.

[26] Protect yourself from the coronavirus? It is real! *VCIOM survey*, April 2.

Weekly dynamics of the assessment of the RF President's work (VCIOM data), % from a number of respondents



though difficult times are experienced by a majority of Russians, the President's support remains stable, and it started to increase since the moment of introduction of all-Russian quarantine in the country[27] *(Figure)*.

People can see that all elements of the state administration system work dynamically; the State Duma and the Federation Council make quick decisions, and, if necessary, make legislative changes, which take effect immediately after the adoption; all this work is mobilized personally by the President, who basically holds various kinds of daily meetings[28] with cabinet members, governors, and experts. After such meetings, within a few days, specific decisions are adopted, and a real assistance is provided to population, business, the health system, and the economy itself.

Another "ahead of the curve" step was the amendment to the Constitution of the Russian Federation, proposed by a deputy of the State Duma of the Russian Federation V.V. Tereshkova.

It is no secret that V. Putin, who, according to the 1993 Constitution of the Russian Federation, was supposed to resign in 2024, is the only guarantor of the Constitution itself and of the entire course of the development focused on sovereignty and priority of national

[27] *On Declaring Non-Work Days in the Russian Federation: The President's Executive Order,* dated 25.03.2020. Available at: http://www.kremlin.ru/events/president/news/63065

[28] Let us remind that the first meeting on countering the spread of coronavirus was held by the President of the Russian Federation on January 29, 2020. It had happened two days before the first cases of infection were recorded on the territory of the Russian Federation.

On March 15, a working group of the State council on countering the spread of coronavirus was organized by the Decree of the President of the Russian Federation.

Since then (in fact, in a month, from March 15 to April 18, 2020), Vladimir Putin has held more than 25 different meetings dedicated to preventing the epidemic, supporting the economy and various industries. He personally checked the work of the Center for monitoring the coronavirus situation (March 17) and visited a specialized hospital in Kommunarka (March 24); he addressed citizens three times.

From mid-March to mid-April, around 50 Government's resolutions and Presidential decrees on measures to support the economy and business, the population, the health system, and the organization of epidemiological (quarantine) measures were adopted.

interests. However, the amendment to "nullify" presidential terms, proposed on March 10, 2020, completely changed the situation by guaranteeing the possibility of implementing a nationally oriented development course conducted by the President. Even despite non-system opposition's reflex protest reaction toward the fact that there were no wide public debates on the "Tereshkova's amendment", the logic of tense global events contributed to the fact that this amendment was included in the general Law "On improving the regulation of certain issues of the organization and functioning of public authority"[29], signed by the President on March 14, 2020, and was approved by the Constitutional court of the Russian Federation (March 16, 2020[30]). The idea of "nullifying" V. Putin's presidential terms was supported by a majority of Russian society: according to VCIOM, 73% of Russians knew about this initiative, while 64% of respondents said that they would vote for amendments to the Constitution[31].

The very possibility of a new presidential term for V. Putin is itself a guaranteed opportunity and a signal to elites to continue implementing a nationally oriented political course if "something goes wrong". This abstract phrase refers not only to the economy or international relations' problems but also to possible liberal forces' attempts to take advantage of the power transit and tilt the scales of public administration in their own direction.

> "Political forces that dream about returning to the 90s have not been making any differences on the Russian political Olympus for a long time, but **they have not disappeared.** The "beneficiaries of the 90s" are not limited by the "non-system opposition" which the President recently called "beneficial" for the "system". This is a part of economic and political elites who want to survive Putin's rule and return everything"[32].

At the same time, it should be noted that, at least, two more potential presidential terms of V. Putin are not a "panacea" for deep internal problems that firmly rooted in the Russian system of public administration in the last 30 years.

During his previous presidential terms, V. Putin managed to do a lot. In particular, it would be impossible today to talk about the division of "centers of gravity" in the system of state administration and a higher role of society in decision-making and control of state structures' activities without a political and civil maturation of society to the level that allows the President to make such proposals. It is no accident that a new term appeared in the political space of the country – "the system of public power" which "turns into a common denominator for all authorities" and "at the first approach, it means a power that is open and accountable to society"[33].

[29] On improving the regulation of certain issues of the organization and functioning of public authority: Russian Federation Law on the amendment to the Constitution of the Russian Federation, dated 14.03.2020. *Official website of of the President of Russia*. Available at: http://www.kremlin.ru/acts/news/62988

[30] Conclusion of the Constitutional court of the RF on the compliance with provisions of chapters 1, 2, and 9 of the Constitution of the Russian Federation of provisions of the Law of the Russian Federation on amendments to the Constitution of the Russian Federation "On improving the regulation of certain issues of the organization and functioning of public authority" that have not come into force, and the compliance with the RF Constitution of the procedure for entry into force of article 1 of this Law in relation to the request of the President of the Russian Federation. Available at: http://doc.ksrf.ru/decision/KSRFDecision459904.pdf

[31] VCIOM data for March 11, 2020. Available at: https://wciom.ru/index.php?id=236&uid=10196

[32] Skorobogatyi P. Putin creates a "deep state" in Russia (materials of an interview with political scientist, teacher of MGIMO MFA of the RF A. Zudin). *Expert*, 23.03.2020, no. 13, p. 42.

[33] *Ibidem*. P. 43.

"In general, we may talk about changing the "center of gravity" of the political system. An "extended" version of the "center of gravity" is formed, the system's connectivity and the ability of various elements to work to work together increase"[34].

However, the question of how the system of state administration will function without its main actor will not be removed from the "agenda" until the head of the state solves, for example, the main task – the nationalization of elites. Without it, there would be no fundamental changes in issues concerning personal responsibility, professionalism of strategic planning, moral attitude of ruling elites to the management of the country and people's lives, and, ultimately, no further construction of the Russian state based on principles of priority of national interests, social justice, and sovereignty. Without these components, it is impossible to make a breakthrough in solving the most relevant problems that concern the population.

According to scientists, "there are 20 million poor people in Russia according to official data. **In fact – 57 (if we look only at incomes) and 120 million (more than 85% of population) if we look at income and housing conditions... That is, 3 million of "rich" people versus 57 million of "poor" people. This data is based solely on incomes, without considering accumulated property and assets of so-called "oligarchs".** It is a huge gap"[35] *(Tab. 2)*.

Similar amount of problems has accumulated in the public administration system itself. Even though D. Medvedev's liberal government was replaced by a team of professionals "sharpened" to solve specific, functional problems, not all experts optimistically assess prospects of the Cabinet of Ministers headed by M. Mishustin.

Table 2. Distribution of Russian population by income level

Group	Number		Income level	
	mil. people*	% from total population	number of subsistence minimums	rub.
People below the poverty line	19.09	13	< 1	< 10328
People with low-income (poor)	41.11	28	≤ 2	≤ 20656
Intermediate level	33.77	23	2 – 3	20656 – 30984
People with middle-income	46.99	32	3 – 11	30984 – 113608
People with high-income	2.94	2	> 11	> 120000

According to: Exorcist Golikova will drive the poor out of the country. Interview with chief of the laboratory on problems of the level and quality of life of the Institute of socio-economic problems of population at RAS prof. V.N. Bobkov. Argumenty nedeli, 07.02.2019, p. 3.
* Average permanent number of population in Russia in 2018 was 146.830.576 people (Source: Database of the Federal State Statistics Service. Available at: https://www.gks.ru/folder/12781)

[34] Skorobogatyi P. Putin creates a "deep state" in Russia (materials of an interview with political scientist, teacher of MGIMO MFA of the RF A. Zudin). *Expert*, 23.03.2020, no. 13, p. 45.

[35] Exorcist Golikova will drive the poor out of the country. Interview with chief of the laboratory on problems of the level and quality of life of the Institute of socio-economic problems of population at RAS prof. V.N. Bobkov. *Argumenty nedeli*, 07.02.2019, p. 3.

Experts about the composition of the RF Government headed by M.V. Mishustin[36]:
Mel'nichenko O.V. (member of the Federation Council from the Penza Oblast): " ***All new members of the government – people who have been successful in their professions, who have experience of work in regions, universities, and large enterprises. People who have actually walked the land, and who know their industries.*** *This is encouraging".*
Danilin P.V. (director of the Center for Political Analysis): "***Update of the Cabinet of Ministers corresponds to the staff policy of the President, who responds to the existing social request for changes.*** *Certainly, the new government will be engaged in implementing May decrees and national projects with new strengths".*
Badovsky D.V. (head of the foundation "Institute for Socioeconomic and Political Research"): *"The government becomes technological to* ***achieve efficiency in the implementation of national projects*** *at the expense of management digitalization and social policy too. These topics* ***are very close to the Prime Minister****. The government also aims to ensure a significant increase of the economic growth rate".*
Kolesnikov A.V. (head of the program "Russian domestic politics and political institutions" at Carnegie Moscow Center): "*Mishustin has a technocratic function.* ***He is a man, more or less, non-clannish, without especially expressed political values, who has experience of setting up a large organization and digitalization.*** *He is a technologized person who does not cause rejection of different clans. It is good for Putin".*
Martynov A.A. (politologist, publicist, human rights defender): *"As for the overall composition of the new government, it seems that this is a* ***cabinet of professionals and technocrats focused on the implementation of tasks set by the President in his Address.*** *Moreover, the implementation should be fast and energetic. Many announced measures have been in effect since January, we may say since "yesterday". This is exactly what I think these people were brought together for. They were selected according to this principle, competence, and* ***the ability to work efficiently in such difficult, dynamic current conditions****".*
Matveychev O.A. (professor at NRU HSE): "*I assess the new government very positively. Regarding the selection of staff,* ***it looks more professional than the previous one, and certain people are kept in the right place"****.*
Delyagin M.G. (Doctor of Sciences (Economics), economist, publicist): *"****The new Cabinet of Ministers will continue the socio-economic policy of the government of D. Medvedev.*** *As the head of the Bank of Russia, madam Nabiullina is a guarantee of this. Another guarantee is the retention of such iconic government figures as Finance Minister Anton Siluanov and Deputy Prime Minister Tatyana Golikova*[37].
Stanovaya T. (politologist, head of the analytical company R. Politik, expert of the Carnegie Moscow Center): *"The government will indeed be technocratic but in a narrow bureaucratic sense, according to the logic of "small affairs"...* ***this is the limit of tasks – no structural reforms should be expected"***[38].

[36] Sources:

Politicians and experts assessed the new composition of the Government. *RIA Novosti*, 21.01.2020. Available at: https://ria.ru/20200121/1563696035.html; Muhametshina E., Nikol'skiy A. "The government becomes technological". Experts on the new composition of the Cabinet of Ministers. *Vedomosti*, 22.01.2020. Available at: https://www.vedomosti.ru/politics/articles/2020/01/22/821231-pravitelstvo-stanovitsya-tehnologichnim; Politologists surveyed by "real time" assessed the new composition of the Russian Cabinet. *Real'noe vremya*, 21.01.2020. Available at: https://realnoevremya.ru/articles/163815-politologi-o-novom-sostave-pravitelstva-rossii

[37] Delyagin M.G. Without illusions. *Official website of the Izborsky club*, 20.01.2020. Available at: https://izborsk-club.ru/18710

[38] Stanovaya T. Versatility and youth. What to expect from a renewed government. *Carnegie Moscow Center*, 22.01.2020. Available at: https://carnegie.ru/commentary/80860

Putin V.V.: "Give me 20 years, and I will give you back a strong Russia"[39].

Thus, the country still has a significant number of acute problems mainly because Russia has not had a necessary period for a calm internal development during the entire period of V. Putin's presidential term[40]. The solution of these problems will largely depend on the international situation (especially, political and economic consequences of the pandemic); on the rate of national projects' implementation slowdown due to economic consequences of the coronavirus epidemic and the efficiency of authorities' solution to support most groups of population. An equally important factor will be the ability of the public administration system to function efficiently in the new political environment. It will be put into effect after the all-Russian vote on amendments to the Constitution if they are supported by most of the country's population.

A new National Security Strategy may become a real asset for improving the efficiency of public administration at all levels. It should be developed next year[41] and, let us remind, it is carried out under the personal control of the President[42].

Key differences between the current National Security Strategy, signed by V. Putin in 2015, and National Security Strategy – 2009, signed by D. Medvedev, were given in our previous article. We noted that practically every paragraph in it was given "a completely new content, and the general summary of these innovations is aimed at developing the level and quality of life of "ordinary" Russians and ensuring the sovereign, independent development of the country"[43]. Here we would like to say that, **in unison with a new (or, rather, updated) Constitution of the Russian Federation, National Security Strategy – 2021 should provide a state guarantee and a possibility to really ensure all social, political, cultural and value responsibilities taken by the state in relation to Russian society.**

It means not just maintaining main provisions of the Strategy – 2015, related to the protection of national interests at international and domestic levels, but also its development in accordance with conditions, which changed over the last 6 years, **and new (mainly social) obligations assumed by the state in accordance with a new version of the Constitution.** It includes "ensuring the provision of affordable and high-quality medical care", the formation of "a system of citizens' pension provision on the basis of principles of universality, justice, and solidarity", "indexation of pensions at least once a year", "guaranteed minimum salary not below the minimum subsistence level of able-bodied population»[44]. **In other words, obligations the implementation of which should be tangible for each citizen of our country.** It implies the

[39] Zhang M., Guen S. *Vladimir Putin's Political Economy*. SPbGU, 2018, p. 28.

[40] Over the past 20 years Russia has gone through the Chechen war (2000), the Georgian-South Ossetian conflict (2008), the global financial crisis (2008), the Ukrainian crisis (2013), the war in Syria (2015). In addition to these events, the gradual restoration of Russia's geopolitical status faced increasingly aggressive opposition from many western countries in the form of anti-Russian sanctions by the US and the UN, the targeted spread of Russophobic sentiments, etc.

[41] In accordance with the Federal Law "On strategic planning of the Russian Federation" (no. 172-FZ, dated June 28, 2014), the National Security Strategy should be updated every 6 years. The current Strategy was signed by V. Putin in December, 2015.

[42] On the Strategy of National Security of the Russian Federation: the RF President's Decree no. 683, dated 31.12.2015. *Rossiyskaya Gazeta*, 31.12.2015. Available at: http://www.rg.ru/2015/12/31/nac-bezopasnost-site-dok.html

[43] Ilyin V.A., Morev M.V. Another Step toward V. Putin's "Long State". *Economic and Social Changes: Facts, Trends, Forecast*, 2020, vol. 13, no. 1, p. 16.

[44] On improving the regulation of certain issues of the organization and functioning of public authority: FZ no. 1. dated 14.03.2020. Available at: http://duma.gov.ru/news/48045/

formation of **a new generation of elites** focused on priorities of national development and capable of ensuring dynamic development of the level and quality of life among majority of population.

The next decade, therefore, is the time for Putin, as the President, national leader, and guarantor of the Constitution, to build an efficient and stable system of vertical public power that can function without him, without "manual" management, and work in accordance with Russia's national interests, including ensuring independence and competitiveness in the international arena.

Perhaps, determining factors of Russian statehood's further development are the President's decisions, which remain unpredictable for many experts. V. Putin has always been aware of his historical responsibility to the country, and he has never avoided it. A voter sees that the President takes responsibility for everything that happens in the country and how it looks in the international arena.

Let us remind that, in his first official speech as the President of the Russian Federation, V. Putin emphasized that he addresses "Russian citizens". He began his speech with words that, by and large, may characterize all his further actions during subsequent presidential terms, including current times, 20 years later:

> **A. Khazin:** "I am not going to predict Putin's actions. **In this sense, he is a grandmaster, and his moves are usually as unexpected as they are efficient.** Therefore, I am inclined to believe that **he still has a lot of reserves, and they will be put into action.** We do not know about them yet. But I can say one thing: any person who understands that it is necessary to return to conservative values should support Putin today"[45].

"I understand that I took a huge responsibility, and I know that, in Russia, the head of state has always been and will always be the person who is responsible for everything that happens in the country"[46].

Twenty years of V. Putin's presidency give reasons to believe that, with such ideology of responsibility of the highest official, we will withstand the challenge in 2020 and during his subsequent presidential terms.

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Industrial Policy: New Realities, Formation and Implementation Issues*

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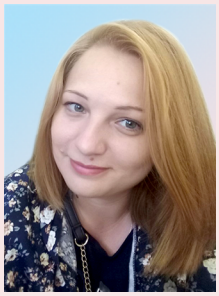

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Abstract. The article presents the conducted comparative analysis of changing target points for the industrial policy formation in the economies of developed countries and in Russia. The authors have justified that the goals of industrial policy should not be just attractive to the state and business, but also contribute to the formation of a favorable business environment, as well as to the growth of public welfare. It has been established that in conditions of "the trauma society", only short-term priorities of the industrial policy can be implemented. New realities fundamentally influencing the industrial policy priorities have been revealed. The researchers have justified the expediency of integrating the industrial policy into the general vector of Russia's strategic documents. The authors have proposed to elaborate the regional industrial policy within the framework of the Ural Federal District as one of the 12 macroregions

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in the country marked in the Strategy for spatial development of the Russian Federation for the period up to 2025. Analyzing "the Updated Strategy of the EU Industrial Policy" and numerous studies in the field of circular economy formation has allowed to justify the need for industrial policy measures to stimulate the transition to the circular economy with including the basic principles of such transition in the strategic documents regarding the development of Russia and its regions. The authors have stressed the inextricable link between the circular economy formation and digitalization. It has been shown that in the interpretation of foreign researchers in comparison to national authors the digital transformation, as well as the industrial policy, has positive qualitative changes of socially significant results as the ultimate goal. The priorities in the field of the national industry's digitalization for their support by the industrial policy instruments have been structured. The researchers have emphasized the acceleration of implementing technological solutions happening in the process of digitalization, which are based on the information systems having artificial intelligence. The authors have revealed the priority areas aimed at supporting the development of artificial intelligence by the industrial policy. It has been established that the latest technologies have an impact on changing the industrial policy priorities, and transform the state's economic role and modern business models. The interaction between the new subjects and objects of the industrial policy is the basis for the formation of the qualitatively new network industrial policy.

Key words: industrial policy, evolution of industrial policy notions, new technological trends, development strategies and priorities, circular economy, digital transformation, network industrial policy.

Introduction

Industrial policy is one of the most popular tools for creating a structurally balanced, competitive economy implementing the most modern technological and institutional trends. The expression of D. Rodrik, a classic in the field of industrial policy, is widely known: "... the challenge in most developing countries is not to rediscover industrial policy, but to redeploy it in a more effective manner." [1].

The emergence of various technological, environmental and socio-economic trends in the development of the world economy has predetermined the adjustment of target points for the formation and implementation of industrial policy. If in the period from the XIX century to the first decades of the XX century the goal of industrial policy was to create a powerful industry, then from the first decades to the 60s of the XX century it has been adjusted taking into account basic social guarantees as a prerequisite for the implementation of any technological solutions. Since the beginning of the XXI century, almost all developed countries, at the early stages of industrial policy formation and implementation, have given priority to solving social, environmental, and ethical problems as preliminary grounds for making a final verdict on the possibility of implementing any new technological changes. Modern domestic and foreign literature contains the results of numerous studies concerning the essence of industrial policy, its understanding and application in different countries [1-10]. The purpose of this article is to analyze the new realities of economic development predetermining a significant adjustment of the domestic industrial policy priorities.

To achieve the goal set, it is necessary to analyze the evolution of the concept of "industrial policy" in Russia; identify the new realities fundamentally affecting the industrial policy priorities; systematize them in the field

of the latest technological trends; establish changes in the priorities of domestic industrial policy supported by the Industrial Development Fund.

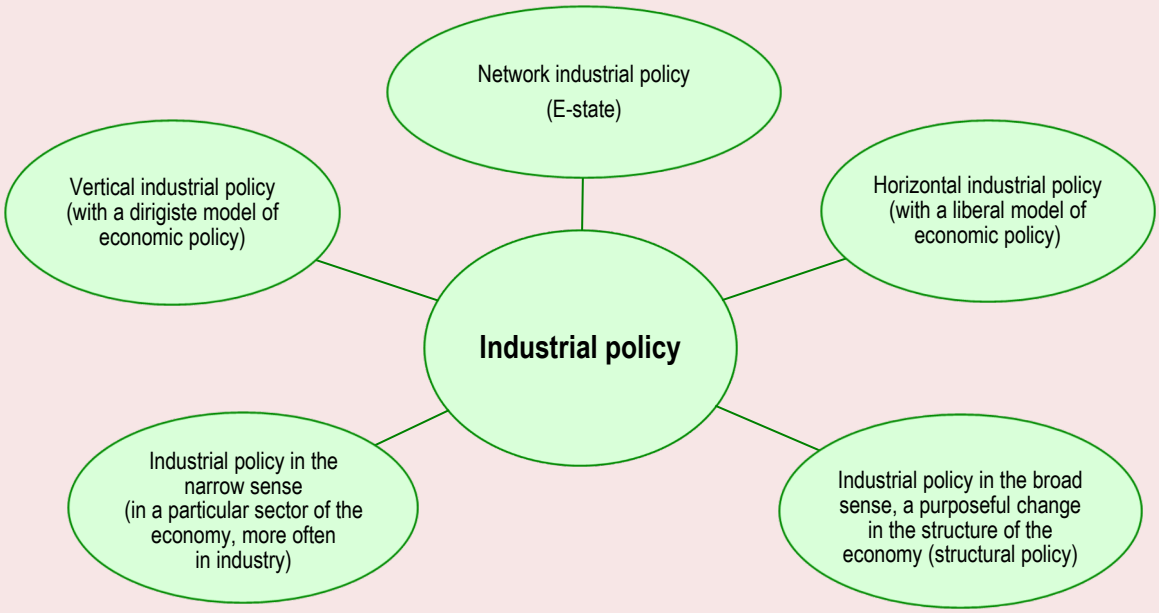
The concept of industrial policy

Despite the fact that industrial policy has been widely used in the practice of the world economy for more than a century, the discussions about the concept of "industrial policy", the interpretation of its economic content, target orientation, and possible implementation mechanisms continue until the present. There is a relative consensus on the validity of considering industrial policy as a horizontal policy implementing a system of measures to create a favorable business climate for all economic entities, and understanding it as a vertical policy supporting selected industries.

In recent years, when the formation of a network economy is increasingly being discussed, industrial policy has been interpreted as a network policy implemented by the so-called digital state (E-state). It is also widely interpreted as policy in a loose sense (aimed at changing the structure of the economy as a whole) and in a near sense (when it comes to a particular sector of the economy) (*Fig. 1*). Various industries are considered as sectors, such as production sector, agriculture, tourism, etc. The concept of industrial policy in the near sense, applied to the industrial sector of the economy, has become the most widespread in our country.

Having traced the evolution of industrial policy concepts proposed by a number of institutional actors in Russia for the period since 1998, i.e. the year of the beginning of fundamental changes in the economic and political life of the country until 2014, when the Federal law "On industrial policy in the Russian Federation" was approved, one may conclude that the object of its regulation consistently shrinks from the structural proportions of the economy as a whole to just the industrial sector. In addition, if the initial interpretations focused on the development of human potential, the

Figure 1. Types of industrial policy



Source: compiled by the authors based on [4; 8; 10; 11; 12; 13].

Figure 2. Evolution of the concept of "industrial policy" (1998–2014)

country's socio-economic development, the law "On industrial policy in the Russian Federation" completely lacks any aspects in the field of personal potential and social welfare development (*Fig. 2*).

The analysis of publications [4; 8; 9; 10; 12] makes it possible to identify the most complete interpretation of the concept of "industrial policy" that integrates various definitions, corresponding to the concept proposed by UNIDO and the OECD.

"Industrial policy is a public policy aimed at improving the business environment or the structure of economic activity by sectors and technologies providing better prospects for economic growth and social well-being compared to the absence of such intervention" [10]. The advantage of this definition is, in our opinion, the understanding of industrial policy not just as a set of legal, economic, organizational and other measures aimed at developing the country's industrial potential. It is emphasized here that industrial policy is a state policy, which means that, like any policy, it reflects the system of relations between the state, business, and civil society institutions regarding the achievement of the agreed goals. This definition identifies such goals as both improving the business environment and enhancing the structure of economic activity by sectors. This brings together the positions of researchers who support both horizontal and vertical industrial policies. In addition, it is important to emphasize the need to ensure the public welfare growth, which fully corresponds to the evolution of the concept of "industrial policy" in the world economy over the past two centuries.

The understanding of industrial policy as a system of relations between the state and various actors in its economic and social life mainstreams the problem of choosing the industrial policy priorities of any state. In general, this choice is determined by the level of civilizational, socio-economic and technological development of society, and the peculiarities of the population's mentality.

An important condition for this is the state of society in which it is located. During the period of the state's evolutionary development, the long-term priorities of industrial policy can be formed and implemented; revolutionary development usually involves a radical break in the previously formulated directions with the subsequent development of short-term priorities. A special approach to the selection of industrial policy priorities is required in states characterized by the existence of the so-called "trauma society" [14]. It is characterized by a long state of uncertainty in the transformation of social relations; serious deformation of economic, social, political and spiritual and cultural processes; inconsistency in the actions of political and economic actors, who often represent corporate or group egoistic interests; the transition of power resources to capital and the mutual transition of capital to power resources; a sharp increase in social inequality, etc. In this regard, the following hypothesis arises: the "trauma society", the main features of which can be observed in modern Russia, lacks the necessary conditions for developing long-term industrial policy priorities. This state of affairs largely explains the frequent change of development priorities declared by the government.

Raising the issue of development priorities inevitably leads to an adjustment of industrial policy goals. Solving economic, socio-environmental and humanitarian problems becomes mandatory within its framework, which fully corresponds to the above-mentioned concept of industrial policy formulated by UNIDO and the OECD. At the same time, it is very important that the goals would be attractive not only for business, government and society, but also their achievement would lead to significant results in terms of creating a favorable business environment for economic and industrial development and the growth of public welfare [15].

New realities having a fundamental impact on the industrial policy priorities

The rapidly changing political and economic situation in the world, the emergence of new technological trends characteristic of the fourth industrial revolution, which not only transform the macroeconomic structural proportions, but can also lead to unpredictable changes in the field of social and ethical relations, indicate the need for a fundamentally different approach to management decision-making, especially in the field of industrial policy. It should be integrated into the overall vector of strategic documents. Moreover, the adjustment of industrial policy priorities depends on the increasing importance of taking into account the latest development trends, forming the so called "new reality", which involves the focus on spatial development of the economy, the formation of circular economy, digital transformation, the development of artificial intelligence technologies.

Industrial policy integration into the overall vector of strategic documents. An ambiguous assessment of the prospects and consequences of the implementation of some of the above directions determines a fairly high probability of various risks. The most significant of them are noted in the annual report of The World Economic Forum (Davos 2020), where five global risks are highlighted: slowing

economy and social tensions, climate change, species biodiversity declining, cybersecurity issues, and new challenges in public health[1]. As you can see, three of the five global risks are directly related to the environment, and one is related to increasing social tensions. This confirms the mandatory requirements to the new principles of industrial policy formation related to the system of measures for regulating economic, technological, social and environmental development.

In these conditions, the vector of industrial policy formation cannot be considered as the preferred direction of industrial development (in accordance with the Federal law "On industrial policy in the Russian Federation") without taking into account social and environmental factors. It should be integrated into the overall system of strategic documents that determine the future of the country, so the task of forming a new industrial policy configuration (multidimensional policy) arises. It is the result of high risks from the allocation of sectoral priorities, the possibility of identifying erroneous technological priorities and the likelihood of unreliable estimates of the expected effectiveness of their implementation. To level the potential risks, it is advisable to form the so-called "pilots" of industrial (i.e. structural) policy [16]. In some studies, industrial and structural policy are considered as synonymous concepts [5; 16; 17].

The integration of industrial policy into the general vector of strategic documents forming the future of the state makes it necessary to comment on the most important, recently adopted strategic documents regulating Russia's development, forming the "new reality". We are talking about such policies and programs as "Strategy for Spatial Development of the Russian Federation for the Period up to 2025", "Strategy of Environmental Security of the Russian Federation for the Period up to 2025", National Program "Digital Economy of the Russian Federation", "National Strategy for the Development of Artificial Intelligence for the Period up to 2030". The most important provisions of these documents have become a significant component of national projects.

Spatial development of the economy. The Federal law "On industrial policy in the Russian Federation" does not actually address the spatial aspect of economic development, although for Russia, one of the largest countries in the world by territory, this is a very important area that is subject to mandatory state regulation. The Strategy for spatial development of the Russian Federation for the period up to 2025 is designed to solve this problem in many ways. In our opinion, this Strategy should be considered not only as a tool for allocating the limited resources needed to implement the identified priorities, but primarily, as the basis for the country's preferred future, expressed in the relationship of spatial and industrial development. In addition, it is obvious that it should offer the management solutions necessary to achieve this future, including those in the field of industrial policy. The Strategy for spatial development of Russia identifies 12 macro-regions, and points the creation of investment platforms as a new mechanism for territories' development. A special feature of the Strategy is the priority of supporting the interregional investment projects.

At the same time, it has to be said about the poorly researched justification of the priorities formulated in the Strategy for the selected macroregions; insufficient elaboration of the

[1] *The Global Risks Report 2020*. Available at: http://www3.weforum.org/docs/WEF_Global_Risk_Report_2020.pdf (accessed 30.01.2020).

issues in the area of economic and institutional support for the implementation of federal and regional priorities; lack of information about investment and other resources required for the strategic priorities implementation. It does not contain any proposals for the formation of institutional innovations related to the status of the macroregions. The weak point, in our view, is that there is no reasonable opportunity to make changes more predictable for all the participants of the Strategy development and implementation, and there is no clear system for coordinating the actions of all the parties.

Vagueness, indistinctness, or rather, the complete lack of justification for the priorities proposed in the Strategy, make us analyze the existing foreign experience of developing various strategic documents defining state development priorities more closely. The concept of "smart specialization" for choosing development priorities in the EU countries is of particular interest from this point of view. The most important institutional innovation of the EU in the field of choosing development priorities is the formation of the *Smart Specialization Platform* (S3 Platform)[2]. Its main purpose:

- informational, methodological and expert support to regional authorities in selecting development priorities;
- promoting mutual learning and interregional cooperation;
- creating a bank of priorities, systematized by separate categories for clarification by the regions of their specialization;
- systematization of industrial policy tools supporting the territories' competitive advantages when working out their development strategies.

[2] How can regions and countries join the S3 Platform? Available at: https://s3platform.jrc.ec.europa.eu/registration (accessed 27.01.2020).

Thus, industrial policy that encourages the implementation of the territories' priority competitive advantages is a distinctive feature of smart specialization strategies of the EU countries. It is important to emphasize that such strategies support those development areas that are fully compatible with the business needs.

Russian researchers of the Higher School of Economics conducted a comparative analysis of the compliance of eight strategies for innovative development of the constituent entities of the Russian Federation with the criteria of smart specialization strategies [18], which allowed to identify the elements of smart specialization that are not present in the domestic strategies for the regions' innovative development. The main ones of them are related to the insufficient analytical work, lack of interregional comparisons and clear allocation of state priorities and global technological trends. Innovations are considered without proper connection with the socio-economic context. But the main difference is that the Russian regions do not form a vision of the region's future when creating appropriate strategies. The main conclusion which should be taken into account when working out domestic regional strategies for innovative development is as follows: a strategy formed at the level of a particular region cannot be successful, as it needs deep external knowledge and general rules for selecting and synchronizing priorities.

As previously noted, the Strategy for spatial development of Russia for the period up to 2030 does not define the institutional status of the 12 macroregions, which makes it difficult to implement the interregional investment projects proposed by the territories. At the same time, one of the macroregions, namely the Ural-Siberian region, fully corresponds to the structure of the Ural Federal district in

terms of its constituent entities. This may be the basis for the development of regional industrial policy not only for individual subjects of the Federation, but also for the Ural Federal district as a whole, because in this case a specific subject of industrial policy arises. The macroregion's industrial policy as a tool for implementing interregional investment projects will allow:

- to ensure the concurrency of business entities' actions within each macroregion with the macroregion's interests as a whole;
- to develop interregional cooperation chains;
- to increase interaction between large, small and medium-sized businesses within the macroregion;
- to ensure the coordinated development of industry, regional science, and higher and secondary vocational education between the subjects of the Ural-Siberian macroregion.

However, the success of its industrial policy can only be achieved if the priorities of the Federal industrial policy and the specifics of the industrial policy of the regions forming the Ural-Siberian macroregion are properly taken into account.

Formation of a circular economy. The formation of a circular economy or a closed-loop economy occupies a special place among the new realities having a fundamental impact on the identification of industrial policy priorities. Its concept is at the initial stage of development. At the same time, the EU adopted an action plan to encourage Europe's transition to a circular economy in 2015 already. In 2017, the "Updated EU industrial policy strategy" was adopted, the goal of which is formulated as "strengthening Europe's leadership in a circular and low-carbon economy". All strategic documents in European countries must contain provisions related to the circular economy.

The significance of improving environmental safety and the formation of a closed-cycle economy have predetermined the development of the Strategy for environmental safety of the Russian Federation for the period up to 2025, and the Strategy for the development of industry for processing, recycling and neutralization of production and consumption waste for the period up to 2030, approved respectively in 2017 and 2018. Currently, the Main directions of the strategy for the long-term development of the Russian economy with a low level of greenhouse gas emissions until 2050 are being formed. The national project "Ecology", implemented in the period from 2018 to 2024, should play a special role in the formation of a closed-loop economy. The 11 Federal projects envisaged in it are aimed at eliminating the negative technogenic impact on the environment, reducing pollution of natural resources, and efficient disposing of production and consumption waste. In our opinion, the dubious possibility of attracting extra-budgetary funds, accounting for almost 80% of the total amount of financial support for this national project (NP), is a great danger in achieving the goals laid down in the NP "Ecology"[3].

A special role of industrial policy in the implementation of this NP is associated with the implementation of one of the 11 Federal projects, namely the project "Introduction of the best available technologies". The number of complex environmental permits issued is considered to be the main indicator of the

[3] *Report on the results of the expert-analytical event "Monitoring of the national project "Ecology" implementation including the timeliness of their financial support, achievement of goals and objectives, control points, as well as management quality".* Available at: http://www.audit.gov.ru/upload/iblock/697/6974665033576448bae98baa0e9626e4.pdf (accessed 20.02.2020).

Federal project's goal achievement. However, the permits only apply to the first category items. At the same time, the legislation in the field of industrial policy is not adjusted properly in order to achieve the goals of the NP "Ecology", as well as the requirements of the circular economy. Currently, the industrial development Fund is the main industrial policy tool that can be used to encourage the modernization of industrial enterprises in order to achieve their performance parameters that meet the requirements of the best available technologies (BAT). More than 60% of all investments in the budget of the NP "Ecology" are provided for the implementation of this very Federal project laid down in this NP. Achieving the goals of this Federal project could allow to harmonize the process of implementing BAT with the norms of international law in Russia.

Thus, the instruments of industrial policy should be increasingly reconfigured to apply measures ensuring the implementation of the NP "Ecology" goals and stimulating the transition to a circular economy. The main principles of this transition should be included into the strategic documents for the development of Russia and its regions.

Digital transformation. Circular economy formation is inextricably linked to digitalization. Digital technologies development is one of the most important tasks of the EU industrial policy. Its industrial policy supports the formation of a single digital market and a favorable institutional environment, the implementation of Industry 4.0 technologies, the training of a skilled workforce focused on the activities in digital economy and labor productivity growth. In Russia, the development of digital technologies will be facilitated by the implementation of the national program "Digital economy of the Russian Federation" approved in 2017, as well as the National project "Digital economy" approved in 2018 with implementation dates from 2018 up to 2024. Six Federal projects related to the development of the digital information environment are envisaged within the framework of the NP.

One of the most important Federal projects is a project related to the digital technologies' development, which will have a serious impact not only on all spheres of the economy, but also on the life of society as a whole. These end-to-end digital technologies include artificial intelligence, big data, virtual and augmented reality, new production technologies, industrial Internet, and so on. It is appropriate to use industrial policy tools to stimulate the development of these technologies. Despite the indisputable importance of production digitalization, budget execution for the "Digital economy" NP appeared to be the lowest of all 13 national projects. As of the end of December 2019, the execution of expenditures for the implementation of this project made up only 53.6%[4].

The development of the national project "Digital economy" was largely predetermined by the formation of digital transformation as a global key trend[5] [19–21]. Digital transformation of public administration is taking place all over the world more actively, but with varying degrees of effectiveness [22]. This aspect is particularly significant from the point of view of forming industrial policy in the new reality. It is known that the state is one of

[4] Implementation of national projects: first results. Available at: http://www.audit.gov.ru/audit-national/9508 (accessed 20.02.2020).

[5] Bondar K. What is in reality Industry 4.0? *InnovaCima,* November 9, 2017. Available at: http://innovacima.com/en/2017/11/09/what-is-industry-4-0 (accessed 30.01.2020).

the leading actors in both the formation and implementation of industrial policy. However, we believe that successful digital transformation in this context can only be achieved if digital technologies are used not so much to support the processes of interaction between government structures as to achieve significant results in the industrial policy implementation. Such results should be characterized by progressive structural transformations, the creation of a favorable business climate, and the acquisition of additional public value as the results of state initiatives in the field of digitalization [23].

In accordance with the previously adopted recommendations of the OECD, the basis of digital government is an ecosystem including not only public authorities, but also business structures, institutions and associations of civil society. Such a government consider the use of digital technologies as "an integral part of strategies to modernize public administration in order to improve the delivery of public goods"[6]. Thus, in the foreign authors' interpretation, both digital transformation and industrial policy have the ultimate goal of positive qualitative changes in socially significant results. However, in contrast to this approach, the concept of industrial policy, enshrined in the Federal law "On industrial policy in the Russian Federation", does not even mention the receipt of socially significant results. A similar situation is typical for the domestic understanding of digital transformation. Its interpretation proposed by the Center for strategic development focuses only on the optimization of processes, the appearance of fundamentally new properties, and the economy of resources used. This is not about getting any results that could be significant from the point of view of public value here.

In general, in order to support the digital transformation in Russia, the Federal law "On industrial policy in the Russian Federation" provides for an increase in the programs funded by the Industrial Development Fund, the main tool for implementing industrial policy priorities, by means of including the program "Industry digitalization" into their composition. Its participants can get a loan amount from 20 to 50 million rubles at an interest rate of 1 to 5% and a loan term of up to 5 years. New priorities in the field of industrial digitalization, the implementation of which is funded by the Industrial Development Fund, can be structured as follows:

- formation of a mechanism for retargeting the tool for subsidizing the pilot batches of equipment with a shift in emphasis on digitalization tasks;
- clarification of the software list subsidized by the Ministry of industry and trade of the Russian Federation;
- expanding support measures for software products required for industrial Internet technologies;
- inclusion of the high-tech sector of the economy in the number of recipients of discounts for large companies;
- creating a legal framework for regulating the digital economy;
- engineering and technological systems' reorientation to the environmentally friendly ones.

It should be emphasized that the greatest effect of digitalization will be achieved in an economy where not only traditional industries and services are developed and the cooperative

[6] *OECD Recommendation of the Council on Digital Government Strategies*. 2014. Available at: http://www.oecd.org/gov/digital-government/Recommendation-digital-government-strategies.pdf (accessed 03.02.2020).

Investments in the development of artificial intelligence technologies, 2018

Country	Number of transactions concluded	Amount of investment, million dollars	Investment per transaction, million dollars
USA	429	6398.61	14.92
China	53	5505.22	103.87
UK	124	569.49	4.59
Canada	34	285.17	8.39
Israel	42	278.40	6.63
Compiled by: Artificial intelligence (global market). Available at: http://www.tadviser.ru/a/425392 (accessed 20.11.2019).			

ties between them are formed, but also the personnel with relevant competencies are trained. This problem can be solved with the coordinated implementation of the Federal project "Personnel for the digital economy" included in the NP "Digital economy", and one of the three Federal projects under the NP "Science" ("Development of human resources in the field of research and development"). The implementation of the latter will not only create 50 centers for accelerated training of specialists, 5 international scientific and methodological centers based on universities, but also organize the work of 15 satellite universities for research, training, retraining and internship of advanced digital economy personnel[7].

Artificial intelligence. In the process of economy digitalization, the introduction of technological solutions based on information systems and artificial intelligence (AI) is accelerating. The global market for AI technologies is constantly growing. If in 2013 it was 0.7 billion dollars, in 2017 – 13.4 billion dollars, then by 2022 the volume of this market is going to increase up to 52.5 billion dollars[8]. There is a sharp increase in the number of countries that have adopted national strategies for AI development: 5 in 2017, and 30 in 2018–2019. In 2019, Russia also adopted the "National strategy for the development of artificial intelligence for the period up to 2030"[9].

The Strategy aims to make Russia one of the international leaders in the development and use of AI technologies by 2030. It can be noted that the goal of the AI development Strategy in the US is to maintain leadership in this field by 2030, and in China it is to become a leader in the field of artificial intelligence by 2030[10]. In order for Russia to become one of the international leaders in AI, it requires not only technological, human, and institutional resources, but also significant financial resources. The cost of implementing the Strategy in Russia is estimated at 90 billion rubles for 6 years [24] and is not comparable to the costs of implementing similar goals in all the above-mentioned 30 countries of the world, where the financial support of strategies, determined by annual investments from the state budget, amounts to at least 1 billion dollars per year, and in developed countries it is from 5 to 10 billion dollars per year[11]. The amount of investment in AI in a number of developed countries is shown in the *table*.

[7] *Passport of the national project "Science"*. Available at: https://rulaws.ru/acts/Pasport-natsionalnogo-proekta-Nauka/ (accessed 21.02.2020).

[8] Artificial intelligence (global market). Available at: http://www.tadviser.ru/a/425392 (accessed 20.11.2019).

[9] *National strategy for the development of artificial intelligence for the period up to 2030*, approved by the decree of the President of the Russian Federation no. 490, dated 10.10.2019. Available at: http://publication.pravo.gov.ru/Document/View/0001201910110003?index=2&rangeSize=1 (accessed 20.11.2019).

[10] Artificial intelligence (global market). Available at: http://www.tadviser.ru/a/425392 (accessed 20.11.2019).

[11] *Ibidem*.

The table shows that the largest amount of investment directed to the development of AI technologies is recorded in the United States, but the maximum amount of investment per transaction is observed in China. It is seven times higher than the US equivalent. At the World Economic Forum (Davos, 2020), they noted a high probability that it is currently impossible to assess both the full potential and risks of artificial intelligence. It was emphasized that according to the forecasts, the global gap between countries in investment in digital infrastructure may amount to 1 trillion dollars in the period up to 2040. This, of course, will have a serious impact on increasing social and financial inequality and economic instability[12]. Besides, it is important to take into account the necessary correspondence between the applied technologies and the level of cultural development of the nation. The absence of such a correspondence, according to K. Schwab, leads to serious catastrophes. He also notes that the most advanced technology has limits of its application, and it can cause damage exceeding the positive effect when this limit is gone over [25].

Systematization of analytical materials on the AI development allows to identify the following trends in this area, which, in our opinion, should be supported by industrial policy tools:

- increasing hardware availability;
- developing domestic high-speed and energy-efficient processors;
- producing software and hardware complexes using mainly domestic electronic component base;
- creating and developing special centers for collective use aimed at developing prototypes of promising elements of the electronic component base;
- creating high-performance data centers.

However, an effective industrial policy can only be implemented if the development and use of AI is provided in a timely institutional manner. The main areas of such support can be structured as follows[13]:

- formation of an institutional structure that analyzes changes in management systems under the influence of AI technologies;
- establishment of a Technical Committee for the AI standardization;
- creation of experimental platforms for testing AI technologies and organizing the interaction of business, government, science and universities;
- emergence of competence centers for AI;
- introduction of a new educational platform in the field of AI (creation of 100 regional universities);
- formation of a broad consortium in the field of AI technology development;
- attracting large businesses to develop and apply AI technologies based on PPP principles.

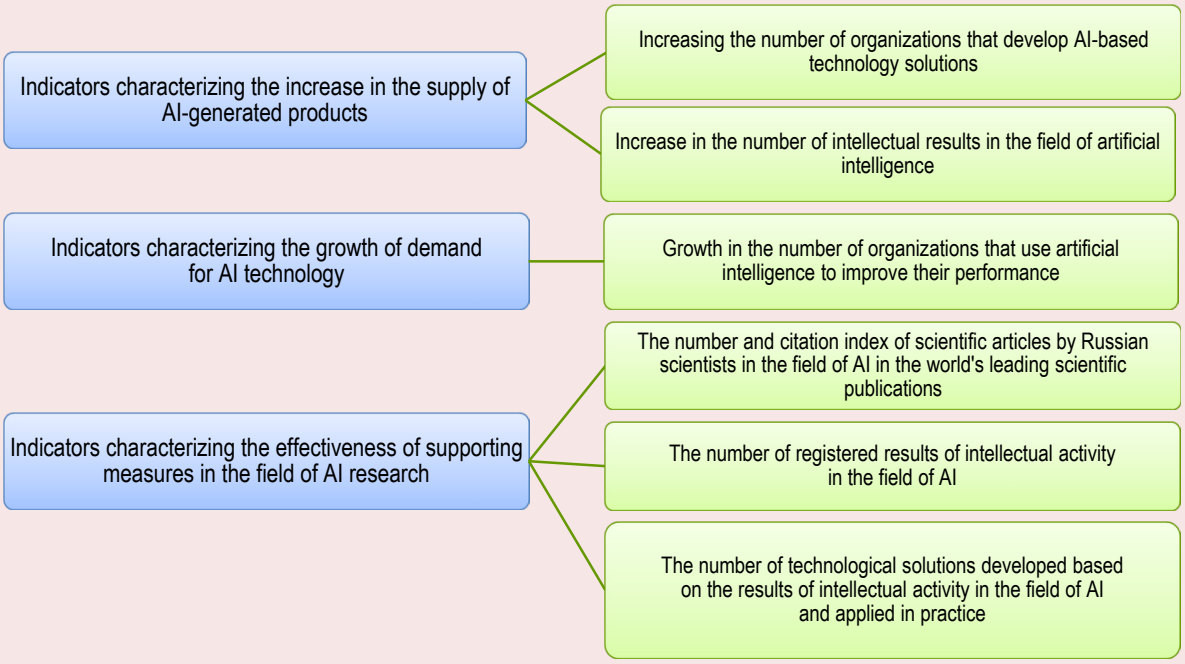
The success of the "National strategy for the development of artificial intelligence for the period up to 2030" implementation is estimated by a number of indicators that can be combined into three groups (*Fig. 3*).

As shown in figure 3, all indicators relate to the so-called target effectiveness or performance. There are no indicators that characterize the cost-effectiveness of the AI technologies developing and using. It can be

[12] *The Global Risks Report 2020*. Available at: http://www3.weforum.org/docs/WEF_Global_Risk_Report_2020.pdf (accessed 30.01.2020).

[13] *National strategy for the development of artificial intelligence for the period up to 2030*, approved by the decree of the President of the Russian Federation no. 490, dated 10.10.2019. Available at: http://publication.pravo.gov.ru/Document/View/0001201910110003?index=2&rangeSize=1 (accessed 20.11.2019).

Figure 3. Indicators reflecting the success of the national strategy for the development of artificial intelligence



Compiled by the authors on the basis of: National strategy for the development of artificial intelligence for the period up to 2030: approved by decree of the President of the Russian Federation dated 10.10.2019 No. 490. Available at: http://publication.pravo.gov.ru/Document/View/0001201910110003?index=2&rangeSize=1 (accessed 20.11.2019).

noted that even in high-tech enterprises, the goal of digitalization is most often formulated as the creation of digital technologies, much less as their serial implementation, but there are practically no indicators that would reflect the effectiveness of digital technology implementation for the consumer. This situation is only one of the problems of the generally ineffective system of strategic planning in Russia. The accounting chamber notes an increase in the indicators highlighting the interim results of the Federal Executive bodies' work, with a decrease in indicators characterizing the final results of their activities[14].

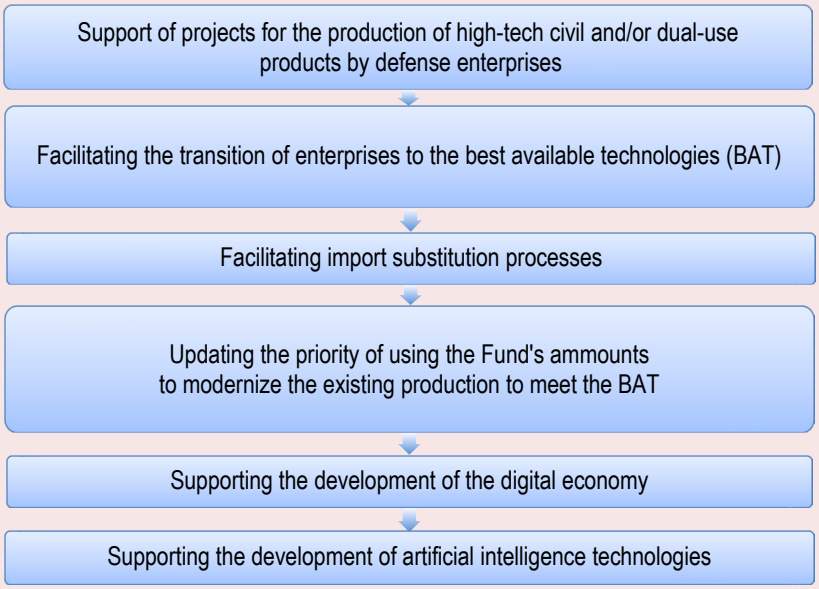
It seems appropriate to update the list of performance indicators of these processes adding the indicators that characterize the cost-effectiveness of the latest technologies as far as the AI Development Strategy is implemented. Despite the urgency of this task, its solution is quite problematic. To date, no clear criteria have been developed to determine the feasibility of specific digital technologies implementing both in the practice of evaluating various types of public policies, and in the real sector of the economy.

Systematization and analysis of the latest strategic documents of Russia's development which form the "new reality" allow to identify the frequent change of priorities supported by industrial policy (*Fig. 4*).

Between 2014 (the adoption of the Federal Law "On industrial policy in the Russian Federation") and 2019, inclusive, the development priorities supported by industrial policy changed six times. On the one hand, this confirms the previously stated hypothesis that the "trauma

[14] Sapozhkov O. Almost everything went wrong. *Kommersant*, 06.02.2020, no. 21, pp. 1–2.

Figure 4. Changing industrial policy priorities supported by the Industrial Development Fund[15]



society" cannot develop long-term priorities for industrial policy. On the other hand, the unprecedented fast pace of global technological development determines the need for timely adjustments in the directions supported by industrial policy.

The strategic vector of such priorities has shifted from supporting the projects for the production of high-tech products for civil and/or dual-use by defense enterprises and the transition of the enterprises to the best available technologies (2014–2015) to support digital economy and AI technologies by the Industry Development Fund (2017–2019).

Conclusion

The research results allow us to conclude that the latest technologies not only affect the change of industrial policy priorities, but also have a transformative impact on the state's economic role and on the latest management technologies implemented by businesses. This leads to the emergence of new industrial policy objects that arise on the basis of integration of information technologies and technologies for processing raw materials and semi-finished products. This situation determines the reconfiguration of production chains, which are becoming a new object of industrial policy. The possibility of formation of the so-called digital state fundamentally affects the subject of industrial policy. Politics becomes multi-subject, including, in addition to the state, business and various institutions of civil society. The changing nature of interaction between the subjects and objects of industrial policy is the basis of a qualitatively new, the so-called network industrial policy. The further direction of

[15] The special investment contract is the most important instrument of industrial policy which is not considered due to changes in the terms of its conclusion in accordance with the Draft Federal Law "On protection and promotion of capital investments in the Russian Federation and amendments to certain legislative acts of the Russian Federation" (prepared by the Ministry of Finance of the Russian Federation) (as of 26.10.2018). Available at: http://www.consultant.ru/cons/cgi/online.cgi?base=PRJ&dst=&n=177555&req=doc#06504714466027548 (accessed 30.01. 2020).

our research is determined by the need to clarify the economic content, essence and principles of network industrial policy development. This will require coordinated interdisciplinary efforts of specialists in the field of economic and technological, socio-ecological, humanitarian and ethical development.

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Methodological Aspects of the Assessment of the Investment and Innovation Potential of a Region*

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Abstract. The relevance of the study is caused by the fact that the increase of the investment activity, which has remained low over the last few years, is a necessary condition for the transition of the country's economy to an innovative development path. It leads to the preservation of technological backwardness which conserves the structure of the economy with a low share of the knowledge-intensive sector. The interdependence and interconnectedness of investment and innovation processes allows us to review the investment and innovation potential as the basis of their development. While studying scientific papers, it was revealed that issues of content, structure, and the evaluation of this potential are debatable, and they require further comprehension. The purpose of this article is to develop methodological provisions

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for assessing the investment and innovation potential of the region. In the course of studying the works of domestic and foreign scientists, the authors of the article investigated approaches to determining innovation and investment potentials and methods of their assessment, clarified the content of investment and innovation potential, identified its structural elements, and proposed a methodological approach to its assessment, which allows establishing the relationship between used investment resources and the results of the innovation activity. During the study, we assessed the investment and innovation potential of Russian regions, identified problems of its formation and the usage, as well as trends that make it possible to determine the guidelines for the development of investment and innovation processes. The methodological basis of the research are the methods of system analysis and synthesis, comparison, generalization, grouping and statistical methods. The results of the study may be of practical interest for regional authorities' activities and the management in order to improve the effectiveness of investment and innovation processes. Theoretical generalizations, contained in the article, might be used as materials for the discussion in a scientific discourse.

Key words: investment and innovation processes, investment and innovation potential, assessment methodology, Russian regions.

Introduction

On the background of rapid technological changes in the global economy, increasing global and local crises, external and internal exports, Russia has no alternative to an innovative development path. Global experience shows that the achievement of highly competitive advantages and the results in the implementation of modernization processes largely depends on the effectiveness of the management of investment and innovation processes. It was also mentioned in the collective monograph of leading domestic economists. They pointed out that "innovation and investment sectors of the Russian economy need to be "reanimated". The low level of innovation activity, insufficient investments into the structural reconstruction, and the lack of interaction between developers of new technological solutions and potential investors show it" [1, p. 4–5]. The interdependence of investment and innovation processes is determined by the fact that the main resource and the necessary condition for the innovation is the investment potential of the territory. Therefore, the current Russian economy needs innovative investments that can provide a new quality of the economic growth. In this regard, we consider the authors' opinion [2] that the basis and the prerequisite for the development of investment and innovation processes is the investment and innovation potential, which has a significant impact on the balanced and sustainable development of the country and its certain regions, to be fair.

The basis for decision-making in the management of these processes should be the assessment of the investment and innovation potential of territories. It confirms the relevance of the research topic and defines the purpose of this article to develop methodological provisions for assessing the investment and innovation potential of the region. In order to complete the aim, we need to complete the following objectives: to conduct the comparative analysis of approaches toward the definition of the essence of "potential" concept, to clarify the content of the "investment and innovation potential" term and its structure,

to justify methodological provisions of its evaluation, which involves a staged assessment of the investment (resource) and the innovative (effective) potentials, to test methodological approach to the evaluation of investment and innovative potential on the basis of materials of the Russian Federation, and to interpret the results.

Theoretical basis of the research

The formation of the conceptual apparatus, used in the study of the investment and innovation development, occurred gradually as new categories and concepts entered the theory and practice of the economic science. However, let us note that the word "investment" has appeared since the beginning of commodity-money relations. In Latin (invest), it originally meant "to clothe", and only later its meaning acquired the concept "invest into something". As for the concept of "innovation", it was first used by Y. Schumpeter, one of the founders of the theory of innovation [3]. These two key concepts became the basis for the formation of terms that reflect the entire set of features of investment and innovation processes. One of the first researchers to use the concept of "innovative potential" was K. Freeman [4], and the practical meaning of this concept was revealed by one of the classic scientists of management theory – P. Drucker, who pointed out that "the innovation begins with the analysis of the existing potential in order to use it effectively" [5]. The term "investment potential" appeared in Russia in the first half of the 1990s, when, along with the term "capital investments", the lexicon of economists was expanded with the "investment" concept. The overview of scientific papers allowed us to identify the following approaches, the usage of which allowed the authors to justify their opinions on the content and structure of studied potentials: resource, cost, resource-target, structural-institutional, effective, resource-effective, process, and functional. It is noticeable that most authors overview the term "potential" (as the investment and innovation) using three main approaches described below.

The resource approach, as the theoretical overview showed, is the most common, because it is related to the essence of the term "potential". In this case, the investment potential is overviewed as an ordered set of resources, capital and other factors that ensure the implementation of investment activities by a market entity [6–8]. The innovation potential is described as an interconnected set of attracted resources, the integrated usage of which ensures effective innovation development of the territory's economic entities [9–11].

The usage of the resource approach has its advantages, because, first, it is possible to assess the current situation of investment and innovation processes (identify strengths and weaknesses). Second, by linking main resource components of potentials with their characteristics and targets, it becomes possible to determine the direction of activation of investment and innovation processes in the future. However, it needs to be mentioned that the resource approach is more focused on extensive factors in the territorial development.

The effective approach allows showing and evaluating the set of resources involved in the process of the corresponding type of activity. The investment potential, in this case, is defined as the total income (result) received from attracting investment resources and implementing an investment project (projects) [12–14], and the innovation potential is defined as the effect (result) from the economic entities' innovation activity as the result of using the territory's own and attracted resources [15–17].

At the same time, we need to note that these definitions of the innovation potential are similar to the definition of "innovation" presented in the "Frascati Manual"[1].

The undoubted advantage of this approach is the opportunity to evaluate the results of investment and innovation activities. However, this approach has some disadvantages. First, the evaluation of the result without the aggregation of used resources does not allow comparing territories with each other. Second, with this approach, it is difficult to determine the path of the territory's development (extensive or intensive).

The resource-effective approach links resource and effective characteristics of the potential and shows the ability (readiness) of a territory (in this context, we refer to the socio-economic system of a region or municipality) to implement the effective investment and innovation activity. In this regard, we are talking about used and unused (hidden) resource opportunities that can be put into action to achieve final aims of these processes' participants. From this point of view, in the territorial aspect, the investment potential is the ability of the regional investment system to implement opportunities, contained in its investment resources, in order to achieve a positive maximum result (effect) [18–20]; the innovation potential is a set of opportunities that ensure the maximum ability of the region to independently create, replicate, and use innovations [21–23].

Each of presented approaches is associated with the solution of certain tasks, but, as it seems, the resource-effective approach, which allows estimating the resource component and the result, gives the possibility to determine directions and methods of the studied processes' activation by establishing the interconnection between the resource and productive factors.

Currently, the experience of several Russian regions and foreign countries has convincingly shown that the basis for sustainable balanced socio-economic development of territories is the innovation, the introduction and the dissemination of which is impossible without relying on investment resources. The statement that the investment is a necessary condition and the main source of the innovation has been the leitmotif of domestic and foreign scientists' studies for many decades. Thus, at the beginning of the 20th century, J. Schumpeter in [3] concluded that the investment is a necessary factor of the economic development, and, at the beginning of the 21st century, Yu. V. Yakovets in his work [24], emphasizing the "organic unity of two economic categories", pointed out that "the investment without the innovation is almost a complete loss of competitiveness of goods and markets".

The interdependence of these processes is reflected in the usage of the term "investment and innovation development" in the scientific literature. It allows us to suggest that the basis of this process is the investment and innovation potential. This term, which appeared at the beginning of the 21st century, reflects the objectively existing connection between investment and innovation potentials, which determines their synthesis. As noted before, there are different approaches to determining investment and innovation potentials, but the term "investment and innovation potential", its components, and methods of assessment require further comprehension.

During the theoretical analysis, it was revealed that this concept is the subject of the discussion in scientific works of domestic researchers [2,25,26,27,28,29, etc.]. However, as the literature overview shows, not every

[1] *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data*. 3rd edition. OECD, 2005.

author, studying this most important characteristic of the socio-economic system, tries to determine the essence of this potential. Still, it is important to note that the works of these authors provide the justification of the structure of the studied concept and a set of indicators of its evaluation.

In this regard, the works that present opinions on the content of the investment and innovation potential are of interest. Thus, in [26], this potential is defined as "the total potential of the socio-economic system of a region, which ensures the long-term development of innovation and investment activities, formed by the systematic usage of all types of resources". The author suggests indicators for assessing the potential, which, as we see it, do not fully take into account investment resources needed to activate innovation. The authors of the article [2] point out that the investment and innovation potential is "the combined ability of a region's socio-economic system to ensure the development of innovation and investment areas for purposes and scope defined by economic policy, which is determined by the resource component". This work is focused on factors that affect components of the potential, but indicators for its assessment are not proposed. A slightly different content of the studied concept is presented in [27], where "the investment and innovation potential is a set of priority development directions in the field of creating and using innovative goods and services, produced in a region over a certain period of time, and identified sectors of the economy with the greatest opportunities to attract investments and innovations, which create a favorable investment climate". The author recommends determining the most effective potential investment objects, which, in our opinion, is more consistent with the assessment of investment attractiveness.

It is noteworthy that, by determining the content of the studied potential, the authors [2,26] rely on the resource-efficient approach. We believe that this approach, which is the basis for determining the investment and innovation potential, allows us to identify the interconnection between innovation and investment processes and to determine the structure of the potential, reflecting the resource component and the effectiveness of its usage.

In this regard, we would like to clarify the content of the term "investment and innovation potential" by once again referring to definitions of the "potential" concept. Considering the multi-aspect nature of this concept, we have established that, while revealing the content of this concept, presented in scientific works of domestic researchers, the attention is paid to following aspects:

✓ potential – as a set of resources necessary for the implementation of certain processes (Zhic G.I., Tumusov F.S., Jankovskij K.P., et al.);

✓ potential – as the ability of a system to provide the best possible result (Andrianov D.S., Vasjuhin O.V., Nikolaev A.I., Monastyrnyj E.A., Fedotkina O.P., et al.);

✓ potential – as a measure of readiness to implement set aims (Barancheev V.P., Porshnev A.G., Rumjance A.A., Fridljanov V.N., et al.).

The aforementioned allowed the authors to present their visions of the content of the investment-innovation potential and to clarify its wording *as the ability of a regional system to implement features, defined by the availability of investment resources, in order to achieve the maximum positive impact of innovation and investment activities.*

The comprehension of the essence of the investment and innovation potential determines the approach to its measurement and evaluation, the results of which may become

an informational basis for decision-making aimed at activating investment and innovation processes.

Methodological basis of the research

Taking into account the authors' opinion on the essence of the investment and innovation potential, we assume that the methodology of its assessment should be based on the staged measurement of investment and innovation potentials. Its comparison will allow lowering the level of a region's capacity to implement opportunities, defined by investment resources, providing the achievement of the results of investment and innovation processes that meet aims of the development. The basis of the assessment consists of the following principles of determinism, the availability and the reliability of information, the compliance and the complexity.

While studying the scientific literature, it was defined that there is a wide range of opinions on the structure of investment and innovation potentials, which are summarized in *tables 1 and 2*. These opinions are in the focus of the scientific community's discussion.

Considering the content of tables, we should note that the author's approaches primarily differ in the following points:

– the degree of detail of allocated potentials;
– the number, meaningful characteristics and applicable indicators for the assessment of private potentials;
– sources of used information.

Table 1. The structure of the region's investment potential (within private potentials)

Authors	Types of private potentials
Asaul A.N., Pasjada N.I.	Natural and geographical potential. Labor potential. Production potential. Innovation potential. Institutional potential. Infrastructure potential. Financial potential. Consumer potential.
Bereznev S.V., Sheveleva O.B., Nacheva M.K.	Natural resource potential. Production potential. Financial potential. Labor potential. Innovation potential. Infrastructure potential. Institutional potential. Consumer potential.
Golajdo I.M.	Resource and raw material potential. Financial potential. Production potential. Export potential. Innovation potential. Political potential. Consumer potential. Environmental potential. Intellectual potential. Social potential. Infrastructure potential.
Grishina I.V.	Natural and geographical potential. Production and financial potential. Social potential.
Sheveleva O.B., Nacheva M.K.	Natural and geographical potential. Production potential. Financial potential. Innovation potential. Infrastructure potential. Social potential.
Capo I.P., Savel'eva I.P.	Financial potential. Economic potential. Social potential.
Source: own compilation [18, 30].	

Table 2. The structure of the region's innovation potential (within private potentials)

Authors	Types of private potentials
Kasataja I. L.	Personnel potential. Organizational potential. Material and technical potential. Information potential. Management potential. Financial potential. Scientific and technical potential.
Kokurin D. I.	Resource potential. Efficient potential. Internal potential.
Lisin B. K., Fridljanov V. N.	The reserve of scientific and technical (technological) own and acquired developments and inventions. The state of infrastructure capabilities of enterprises. External and internal factors. The level of the innovation culture.
Matvejkin V. G.	Material and technical potential. Information potential. Financial potential. Human potential. Potential of state support. Infrastructure potential.
Trifilova A.A.	Innovation-oriented departments. Professional staff. Financial resources. Material and technical equipment. Intellectual property.
Shevchenko I. V.	The achieved level of scientific and technical development. Institutional component. Innovation infrastructure. Personnel component.Internal and external environment conditions.
Source: own compilation [31].	

On the basis of domestic scientists' studies, conducted in different periods, and aforementioned principles, the structure of the investment and innovation potential (within private potentials) and the list of basic indicators were determined (*Tab. 3* and *4*).

Table 3. Indicators for assessing the region's investment potential (resource component)

Private potentials	Indicators	Characteristics of private potential
Labor potential	– the share of employees in a region in the total number of employees in the country, in %; – the level of participation in the population's labor force at the age of 15–72, in %; – the share of employed population with higher and secondary vocational education, in %;	describes the territory's potential in attracting labor resources, including highly qualified ones, to participate in the reproduction process;
Production potential	– volume of industrial products per capita, thousand rubles; – volume of agricultural products per capita, thousand rubles; – volume of construction works per capita, thousand rubles;	describes potential opportunities of the economic activity of business structures and the territory's population as the basis of the investment process;
Material and technical potential	– the share of fixed assets of the region's organizations to the total value of fixed assets in the country, in %; – fund availability of the region's organizations, thousand rubles / person; – deterioration coefficient of fixed assets in the region's organizations, in %;	describes potential opportunities of material and technical basis of the region's organizations for the implementation of the investment and innovation activity;
Financial potential	– the amount of the balance financial result per capita, thousand rubles; – the region's consolidated budget per capita revenues, thousand rubles; – average per capita income of the region's population, thousand rubles.	describes potential opportunities of a region in attracting financial resources, which might be included in the investment and innovation process.
Source: own compilation.		

Table 4. Indicators for assessing the region's innovation potential (efficient component)

Private potentials	Indicators	Characteristics of private potential
Educational potential	– the number of personnel engaged in research and development per 10 thousand people of the population; – the number of researchers with academic degrees per 10 thousand population; – the number of students engaged in bachelor, specialist, master's programs per 10 thousand people of the population	Characterizes the result which shows the number of highly qualified specialists for the activation of innovation activities;
Scientific and technical potential	– the share of the volume of innovative goods, works, services in the total volume of shipped goods, performed works, services, in %; – innovation activity of organizations, in %; – developed advanced production technologies for 10 thousand people of the population	Characterizes the result shown in the creation of innovative products and technologies that ensure the region's development;
Information and communication potential	– the usage of information and communication technologies in organizations, in %; – the share of organizations that used special software tools in the total number of studied organizations (science, design, training), in %; – the share of households with broadband Internet connection, in %	Characterizes the result showing the formation of the information and communication environment;
Financial potential	– internal research and development costs to GRP, in %; – information and communication technology costs to GRP, in %; – costs for technological innovations, in % from the total volume of shipped goods, performed works, and services.	Characterizes the result that shows financial possibilities of the innovation activity's activation.
Source: own compilation.		

While justifying private potentials, the authors proceeded from the following:

1) the structure of the investment potential highlights the most important investment resources that largely determine the investment activity of the region;

2) the structure of the innovation potential indicates key results of the innovation activity, which are the guidelines for the innovation development in relevant strategic documents;

3) the number of private potentials, taking into account included indicators, allows conducting the comprehensive assessment of the studied process on the basis of state statistics data and making the acquisition and the interpretation of the results available.

The selection of methodological approaches has an important role in the assessment of the investment and innovation potential in the territorial aspect. The conducted review of methods of Russian and foreign authors showed that the definition of investment and innovation potentials of a region is carried out using one out of six main approaches that have unique specific techniques and methods: the assessment of a universal indicator, rating, integral, factor, cluster, and matrix approaches [32–48].

Taking into account advantages and disadvantages of these approaches, we suggest using an approach that combines advantages of integral and matrix approaches for the assessment of the regions' investment and innovation potential. The combination of these approaches allows:

✓ forming integral indicators of investment and innovation potentials by aggregating private potentials;

✓ assessing the potential of the investment and innovation development of a territory (availability of investment resources and results of innovation activities);

✓ defining the position, which shows the interconnection between investment resources and the results of the innovation activity, of each region by constructing the matrix with coordinates "the level of the investment potential – the level of the innovation potential";

✓ conducting the typology of regions in order to identify problems of the investment and innovative development of territories and to justify key directions of its activation.

The proposed approach is universal and comprehensive. It is possible to use it on any territory and to solve sets of interconnected tasks.

The algorithm for evaluating the investment and innovation potential based on the proposed approach is based on the sequential measurement of the investment and innovation potential of territories and the construction of a final matrix which links the resource and performance components together. It includes three stages: preparatory, analytical, and final.

1. The main goal of *the preparatory stage* is to create the informational basis for evaluating investment and innovation potentials. In order to do this, the selection and justification of indicators for evaluating corresponding private potentials is carried out. After it, the maximum value, which is taken as a standard and equal to one, is determined for each indicator. Remaining indicators are recalculated in shares from one through the division of these indicators by the benchmark one. Thus, the matrix of standardized coefficients is formed.

$$Y_{ij} = \frac{x_{ij}}{x_{maxj}}, \quad (1)$$

where Y_{ij} – a standardized coefficient of j-private potential in i-region;

x_{ij} – value of indicator of j-private potential in i-region;

x_{maxj} – maximum value of the indicator of j-private potential in the entire set of regions.

After it, a basis of initial information is formed in the form of standardized indicators (from 0 to 1) for measuring the investment and innovation potential of each region (within indicators of private potentials).

2. *The second stage* includes the assessment and the analysis of the level of the investment and innovation potential of regions (on the basis of private potentials) in accordance with formed information basis of the research. In order to do this, it is necessary to identify the level of private potentials for each region. It requires squaring of all elements of the matrix of standardized coefficients in order to determine the integral indicator of the private potential (I_{ij}). The resulting values are multiplied by the weight coefficients of indicators, after which the results are added in rows, and the square root is extracted from the resulting sum:

$$I_{ij} = \sqrt{\sum Y_{ij} \times k_{ij}}, \quad (2)$$

where k_{ij} – weight coefficient of j-private potential in i-region. During the formation, I_{ij} weight coefficients for each indicator were equal to one.

In order to define the investment potential $(I_{invest.})$, values of private potentials are summerized for each region:

$$I_{invest.} = \sum I_{ij} \times k_j, \quad (3)$$

where k_j – weight coefficient of j-private potential. During the formation of $I_{invest.}$, weight coefficients for each indicator were equal to 1.

The same procedure was used in order to determine the level of the innovation potential:

$$I_{innov.} = \sum I_{ij} \times k_j, \quad (4)$$

where k_j – weight coefficient of j-private potential. During the formation of $I_{innov.}$, weight coefficients for each indicator were equal to 1.

3. *The final stage includes the following.* First, the grouping of regions is carried out according to the level of investment and innovation potentials. In accordance with acquired values of $I_{invest.}$ and $I_{innov.}$, regions are divided into several groups: with high, medium, and low levels of the potential. The value of the interval *(Int)* for regions' grouping is determined according to the formula:

$$Int = \frac{I_{invest.max} - I_{invest.min}}{n}, \quad Int = \frac{I_{innov.max} - I_{innov.min}}{n}, \quad (5)$$

where $I_{invest.max}$ – the maximum value of the investment potential according to the aggregate of analyzed regions;

$I_{invest.min}$ – the minimum value of the investment potential according to the aggregate of analyzed regions;

$I_{innov.max}$ – the maximum value of the innovation potential according to the aggregate of analyzed regions;

$I_{innov.min}$ – the minimum value of the innovation potential according to the aggregate of analyzed regions;

n – the number of formed groups according to the level of the investment potential.

After it, the matrix is formed. In it, each region occupies a certain position, which shows levels of the investment and innovation potential (*Tab. 5*).

Table 5. The matrix of the regions' investment and innovation potential

Level of the innovation potential	Level of the investment potential			
	High	High	Medium	Low
	High	*Group 1*	*Group 4*	*Group 7*
	Medium	*Group 2*	*Group 5*	*Group 8*
	Low	*Group 3*	*Group 6*	*Group 9*

As we can see in this matrix, it is possible to form the following groups of regions.

Groups 1, 2, 4 ("Leaders") – regions with high and (or) medium investment and innovation potential. These territories have necessary investment resources, the efficient usage of which allows achieving certain results in the innovation activity.

Group 5 ("Middle ones") – regions with medium investment and innovation potential. These territories have good capabilities in general, but the insufficient level of some private potentials may lead to the deterioration of certain results of the innovation process.

Groups 3, 6, 7, 8 ("Problematic ones") – regions (groups 7 and 8) with low investment potential, the lack of which may cause the decrease of the innovation activity and the loss of competitive positions in the future; regions (group 3 and 6) with low innovation potential inefficiently use available investment resources, withdrawing it from the innovation sector of the economy.

Group 9 ("Crisis regions") – regions with low levels of investment and innovation potentials, which significantly limits capabilities of territories to activate investment and innovation processes.

The typology of regions within "the level of the investment potential – the level of the innovation potential" coordinates allows revealing interconnections of mentioned potentials and defining main directions of regional strategies concerning the investment and innovation development taking into account territorial and sectoral aspects.

Results of the research

In accordance with the proposed algorithm, the assessment of the investment and innovation potential of Russian regions was conducted. The informational basis of it was the usage of the official data of the Russian Federal State Statistics Service. In 2013–2017, the number of studied regions was 80 (the sample did not consider data of Sevastopol and the Republic of Crimea due to the lack of data for 2012–2014 period).

During the measurement and the assessment of the investment potential, the following trends were identified:

✓ the territorial structure of the investment potential has not changed dramatically during the study, and the investment activity remains low in most Russian regions;

✓ among private potentials, included in the investment potential, the financial potential has a pronounced asymmetric nature, which indicates a very insufficient financial basis for the technological renewal of economies in most regions;

✓ the following factors have a significant impact on the formation of the investment potential: the availability of fields of fuel and ore resources, the degree of the economic diversification, the development level of social and transport infrastructure.

The assessment of the innovative potential showed the following results:

✓ more than a half of Russian regions are characterized by low efficiency of innovation activities. Main reasons of it are insufficient investment resources and low efficiency of state participation in the regulation of investment and innovation processes;

✓ among the factors that define territorial features of the innovation potential, the following ones should be indicated: the level of the development of the educational and research institutions network, the availability of scientific schools in a region, the demand for innovation products among domestic manufacturers, the level of the commercialization of developments, the degree of the development of the innovation infrastructure, financial resources and public policy.

The final stage included the summary assessment of Russian regions' investment and innovation potential (*Tab. 6* and *7*).

Table 6. Matrix of the investment and innovative potential of Russian regions (for 2013)

Level of the innovation potential	Level of the investment potential			
		High	Medium	Low
High		Moscow (group 1)	Saint-Petersburg (group 4)	Nizhegorod Oblast (group 7)
Medium		Chukotka Autonomous Okrug (group 2)	Magadan Oblast Kamchatka Krai Krasnodar Krai Moscow Oblast Republic of Tatarstan (group 5)	Tomsk Oblast; Kaluga Oblast; Leningrad Oblast; Khabarovsk Krai; Novosibirsk Oblast; Yaroslavl Oblast; Ulyanovsk Oblast; Chelyabinsk Oblast; Chuvash Republic; Samara Oblast; Krasnoyarsk Krai; Sverdlovsk Oblast; Penza Oblast; Republic of Mordovia; Perm Oblast; Voronezh Oblast; Murmansk Oblast; Republic of Bashkortostan; Primorsky Krai; Arkhangelsk Oblast; (group 8)
Low		Tyumen Oblast Sakhalin Oblast (group 3)	Belgorod Oblast Sakha Republic (Yakutia) Amur Oblast Komi Republic (group 6)	Omsk Oblast; Rostov Oblast; Lipetsk Oblast; Stavropol Krai; Kursk Oblast; Udmurt Republic; Ryazan Oblast; Irkutsk Oblast; Vladimir Oblast; Tula Oblast; Volgograd Oblast; Astrakhan Oblast; Republic of Karelia; Orenburg Oblast; Tver Oblast; Altai Republic; Saratov Oblast; Smolensk Oblast; Ivanovo Oblast; Novgorod Oblast; Oryol Oblast; Kirov Oblast; Republic of Adygea; Republic of Dagestan; Republic of Buryatia; Kurgan Oblast; Altai Krai; Republic of North Ossetia – Alania; Jewish Autonomous Oblast; Mari El Republic; Kaliningrad Oblast; Tambov Oblast; Bryansk Oblast; Kabardino-Balkarian Republic; Republic of Khakassia; **Vologda Oblast**; Kemerovo Oblast; Kostroma Oblast; Pskov Oblast; Zabaykalsky Krai; Republic of Kalmykia; Karachay-Cherkess Republic; Tyva Republic; Chechen Republic; Republic of Ingushetia; (group 9)

Source: own compilation.

Table 7. Matrix of the investment and innovative potential of Russian regions (for 2017)

Level of the innovation potential	Level of the investment potential			
		High	Medium	Low
High		Moscow (group 1)	Saint-Petersburg Republic of Tatarstan Moscow Oblast (group 4)	Nizhegorod Oblast Tomsk Oblast (group 7)
Medium		— (group 2)	Belgorod Oblast Lipetsk Oblast Krasnodar Krai Kursk Oblast (group 5)	Penza Oblast; Chuvash Republic; Kaluga Oblast; Republic of Kalmykia; Ulyanovsk Oblast; Khabarovsk Krai; Novosibirsk Oblast; Voronezh Oblast; Sverdlovsk Oblast; Chelyabinsk Oblast; Yaroslavl Oblast; Omsk Oblast; Tambov Oblast; Rostov Oblast; Tula Oblast; Republic of Mordovia; Perm Krai; Samara Oblast; Ryazan Oblast; (group 8)
Low		— (group 3)	Kamchatka Krai Leningrad Oblast Kransoyarsk Krai Kaliningrad Oblast Sakha Republic (Yakutia) Amur Oblast Murmask Oblast Komi Republic Magadan Oblast **Vologda Oblast** (group 6)	Novgorod Oblast; Vladimir Oblast; Republic of Bashkortostan; Orenburg Oblast; Tver Oblast; Stavropol Oblast; Kirov Oblast; Oryol Oblast; Udmurt Republic; Astrakhan Oblast Altai Krai; Primorsky Krai; Mari El Republic;Irkutsk Oblast; Smolensk Oblast; Republic of Adygea; Saratov Oblast; Republic of Karelia; Republic of North Ossetia – Alania; Bryansk Oblast; Ivanovo Oblast; Republic of Buryatia; Volgograd Oblast; Karachay-Cherkess Republic; Altai Republic; Arkhangelsk Oblast; Kemerovo Oblast; Pskov Oblast; Kostroma Oblast; Kabardino-Balkarian Republic; Zabaykalsky Krai; Jewish Autonomous Oblast; Republic of Khakassia; Kurgan Oblast; Tyva Republic; Republic of Ingushetia; Republic of Dagestan; Chechen Republic; (group 9)

Source: own compilation.

The analysis of data, represented in matrices, allowed us to reveal several trends which show changes in the territorial structure of the investment and innovation potential in the studied period:

1) The positive fact is the decrease of the group of crisis and problematic regions. However, collectively, these groups remain quite significant.

2) There were some movements between groups of regions, related to the improvement

and the deterioration of positions. It should be noted that 12 Russian regions increased their indicators of the innovation activity, but the number of regions did the opposite (these are territories with a high share of extractive industries and first-redevelopment sectors in the economy). However, most regions retained their positions in certain groups.

3) It is important to note that significant differences in the parameters of the investment and innovation development between groups of regions remain. It is a serious obstacle to the formation of the new technological order.

On the basis of the results of the grouping of Russian entities, presented on the matrix (Tab. 6 and 7), we defined main guidelines for the investment and innovation development for each of these groups.

1. Groups 1, 2, 4, ("Leaders"). The availability of necessary investment resources and the relatively high efficiency of the innovation process determine the position of these entities as growth poles of the national economy. They determine the vector of the investment and innovation development of Russian regions. The implementation of this function should involve the extension of the cooperation between regions through wider usage of development institutes. It will certainly contribute to the diffusion of innovations and to the strengthening of the integrity of the socio-economic space.

2. Group 5 ("Middle ones"). Regions of this groups have the high level of the economy diversification, comfort living conditions for population, which is a great prerequisite for the strengthening and the extension of investment resources and the increase of the efficiency of its usage for the activation of innovation processes. In order to do this, it is necessary to focus on the development of the material and technical potential, which will lead to the strengthening of the positions of production and financial potentials, and it will create necessary prerequisites for improving the efficiency of the innovation process.

3. Groups 7, 8 ("Problematic ones"). These are innovation active territories, most of which are leading scientific and research centers of the RF, and sectors of specialization are mechanical engineering, metalworking, and petrochemical industries, which, as world experience shows, are focused on the application of product and process innovations. To improve positions in the innovation process, it is necessary to increase investment resources in all private potentials by expanding the practice of public-private partnership, project financing, and strengthening interaction between business and scientific and educational organizations.

4. Groups 3, 6 ("Problematic ones"). In this group, there are territories with a clear raw material component in the economy's structure and regions with more diversified household structure. At the same time, most of these territories have a certain investment attraction. Therefore, it is necessary to use this factor more efficiently, actively supporting the state's investments in innovation technologies through promoting the development of small enterprises in the innovation sphere and in sectors of social infrastructure, as well as the formation of clusters with the participation of scientific institutions and universities.

5. Group 9 ("Crisis ones"). This is the largest and most diverse group of regions in terms of many socio-economic characteristics. For regions of this group to improve their positions, the state must support them: primarily, in the development of social and industrial infrastructure. This will strengthen private investment potentials, increase its investment attractiveness, which will contribute to a more active dissemination of innovations.

Discussion and results

In conclusion, we would like to note that, in the environment of fierce competition on many global markets, the maintenance of a solid position becomes possible through achieving high results in the innovation sphere, the development of which requires significant investment resources. This was the basis for the authors' participation in the scientific discussion on the issues of content, structure, and the evaluation of the concept, which appears more frequently in scientific studies – the investment and innovation potential.

For the development of methodological provisions for assessing the investment and innovation potential, the authors justified the relevance of the usage of this concept, clarified its content, and presented their opinion on the structure of the studied concept. These ideas became the basis for the development of the methodological approach to the assessment of the investment and innovation potential, a distinctive feature of which is not only the capability to assess the investment resources of the territory, but also the result of the innovation process obtained from these resources' usage. In addition, the results of the assessment allow conducting a typological grouping of territories and their ranking, observing changes of regions' positions in dynamics, and justifying key directions of the activation of studied processes. The test of the methodological approach on the example of Russian regions showed limited investment opportunities of many entities of the Russian Federation in achieving high innovation results.

During the research of the investment and innovation potential of Russian regions, the authors argued its importance as an objective basis for the formation of strategic decisions to ensure sustainable socio-economic development of territories. The results of the research contribute to the development of theoretical science, which includes the development of research methodology for the investment and innovation potential. The practical significance of the work is caused by the possibility to use the proposed approach in activities of authorities and in the region's management in order to solve the problem of increasing the investment and innovation activity.

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Econometric Assessment of Social Indicators' Influence on the Regional Economic Growth Dynamics
(Case Study of the Subjects of the Volga Federal District)*

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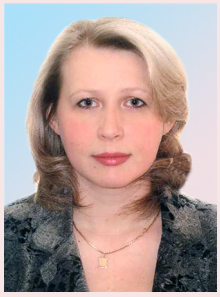

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Abstract. Social factors of endogenous economic growth are becoming the subject of modern research increasingly frequently. The contribution of human capital individual parameters and income inequality indicators are the most studied ones. Cross-country studies lead to conflicting conclusions. The results of Russian research are generally unambiguous, since the regional level of analysis is more similar in terms of institutional conditions and the level of socio-economic development. However, they do not define the nature of the impact of a number of significant social indicators on regional economic growth. In this regard, the purpose of the paper is to determine the nature of the influence of a set of social indicators on the regional economic growth dynamics by means of econometric modeling tools. The methodological basis is made up by the epistemological tools, in particular, system, hypothesis-deductive and dialectical

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approaches, as well as the methods of content analysis and econometric modeling. The most significant results characterizing the scientific novelty of the presented research include the following: 1) it is determined that the impact of the population's birth rate, mortality and morbidity on GRP corresponds to the nature of the dependencies identified for countries having experienced the second demographic transition; 2) it is established that the character of influence of the indicators of "life expectancy", and "the number of students studying in bachelor, specialist, master degree programs" and "the number of employees with higher education in the region's economy" on the GRP does not correspond to the trends in developed countries; 3) it is proved that the inconsistency of the obtained results is a consequence of the underestimation of human capital as the main factor in the development of the Russian economy at the present stage; 4) the extent and consequences of the restraining effect of the analyzed social indicators on the dynamics of regional economic growth are determined. Based on the results of econometric modeling, the priorities of regional socio-economic policy for the medium term are identified, depending on the level of their impact. The authors associate the prospects for future research with a deeper study of the impact of life expectancy and mortality factors on the regional economic growth, as well as the verification of this model for the entire set of regions of the Russian Federation.

Key words: social indicators, regional economic growth, human capital, health capital, education capital, birth rate, mortality, life expectancy, income differentiation, econometric modeling.

Introduction

Currently, there is a wide range of foreign and domestic studies devoted to identifying the connection between the economic growth and individual indicators of the development of national and regional economic systems. For example, S.N. Durlauf, P.A. Johnson, and J.R.W. Temple identified more than 100 such parameters [1]. However, in most studies, the emphasis often shifts from measuring the dynamics of the size of the economy in each country and the level of its national wealth to the need to measure the dynamics of the level of each individual's well-being and society as a whole (for example, [2; 3]). Thus, the importance of social indicators of the development of modern socio-economic systems is emphasized. Among them, a special role is assigned to the qualitative parameters of human capital as determining factors of modern economic growth [4; 5]. At the same time, the importance of two elements of human capital is emphasized: the capital of education and the capital of health [6–9]. The capital of education allows ensuring that human capital meets constantly changing requirements for its quality because of science-intensive, technetronic renewal, and the transformation of productive forces. Health affects the level and quality of human capital; it has a positive effect on productivity and return on its usage at all economic levels [10]. In addition, attention has recently been focused on interconnections between the level of health of individuals and their greater ability to generate new ideas, adapt to new technologies and changes [11], which is one of employers' modern requirements to the quality of employees' human capital (so-called soft skills)[1]. We would like to emphasize that the health capital and education capital are overviewed in the interconnection, since,

[1] We would like to remind that these requirements also include competencies related to the ability of self-education and the ability to learn, the ability to work in a team, motivation to achievements, a high level of empathy, self-awareness, and a constructive response to criticism.

from an individual's point of view, the duration of the usage of human capital becomes a necessary condition for increasing investments in education, because this is the only way when investments in the education capital will be profitable [10; 12; 13].

In addition, scientists identify the level of population's income inequality as one of social parameters that influence the pace of modern economic growth, create conditions, and determine opportunities for the formation and implementation of human capital, [3; 14; 15].

In recent years, the contribution of these social indicators to the efficiency of the development of socio-economic systems has been confirmed by using tools of economic and mathematical modeling of the fact of influence and quantitative measurement. However, unlike theoretical studies, empirical dependences, obtained by foreign and Russian scientists, have different results.

In addition, currently, the influence of the interconnection between fluctuations of economic dynamics and individual social indicators of the development has been studied on the data from these countries and Russian regions, which, on the one hand, limits the scope of research, and, on the other hand, leads to contradictory and sometimes even unreliable results. It seems that the proposed econometric model will allow removing these restrictions and comprehensively determining the significance and contribution of the social component into the economic growth. The justification of the choice of social indicators that allow a comprehensive assessment of its impact on current fluctuations of economic dynamics and form the potential for sustainable development of information, innovation and technology components of regional systems is presented in previous works of the authors [16; 17].

Following the logic of our work, let us dwell on the analysis of the results of empirical studies that assess the impact of the number of indicators of substantial and qualitative changes in the reproduction of human capital, in wealth and depth of social inequality on the pace of the economic growth in Russian regions.

Theoretical and methodological basis of the research

We would like to start by analyzing the results of studies that measure the contribution of human capital to modern economic growth.

Thus, M. S. Delgado, D. J. Henderson, and C.F. Parmeter analyzed 15 different models that reveal the significance and nature of the impact of human capital on economic growth, and demonstrated that scientists come to completely different conclusions: from a positive significant impact to a negative one. Using the traditional Solow model, based on data from 75 countries for the 1950–2005 period, they proved that there is no statistically significant dependence between the economic growth and the rate of human capital accumulation, which was measured using the average number of years of study [18].

The study of E.A. Hanushek and D.D. Kymco, on the contrary, revealed a significant and reliable influence of the quality of human capital on the rate of the economic growth [19].

There are also differences in the results of empirical research on the interconnection between the level of health of the population and GDP. For example, D. Acemoglu and S. Johnson, on the basis of panel data from 47 countries for the period from 1940 to 1980, found that the increase of life expectancy has a positive effect on the population growth but a negative effect on GDP per capita [20]. This result, as emphasized by M. Cervellati, U. Sunde [21], and K. Minamimura, D. Yasu [13], is somewhat surprising, since it challenges

previous theoretical and empirical studies which state that the reduction of mortality and the improvement of public health have a positive impact on the economic growth in the country.

We agree that these paradoxical results depend on the hypothesis's fallacy, the quality of empirical data (for example, on the low quality of human capital data [18; 23; 24], and the model specification [13; 18; 22]. For example, M. Cervellati and U. Sunde divided the sample of D. Acemoglu and S. Johnson between countries into two groups based on classification criteria used in demographic literature: countries before and countries after the demographic transition[2]. The results of the study show that the increase of life expectancy negatively affects GDP per capita in countries that have not yet experienced the transition period, but it positively affects GDP in countries where the transition has already occurred [21].

Undoubtedly, it is caused by the contribution of various factors to GDP growth. Countries that have experienced demographic transition are more likely to develop at the expense of human capital, which, as we noted earlier, is more profitable to invest in if life expectancy increases. In addition, such possibility, as emphasized by a classic of the demographic school K. Davis, appeared only after the transition from a wasteful type of reproduction (high birth rate balances high mortality) to an efficient one (low birth rate with low mortality) which was determined by the industrial revolution [25, p. 7]. The latter released a huge amount of energy from the eternal reproduction – energy chain that can be spent on other aspects of life [26, pp. 68–69]. The result of these processes, using the terminology of K. Davis, "is a striking victory in human efficiency", because the quantitative increase of human capital has been replaced by the increase of its quality (see more [26–29]).

This conclusion is confirmed by the results of the research by K. Minamimura, D. Yasu. In the model, they consider the impact of the quality of human capital of the population and the level of mortality in the country on the dynamics of GDP per capita. In countries with a high level of education, the decrease of the death rate leads to the increase of GDP per capita, while in countries with a low level of education (and fewer resources), on the contrary, opposite dependencies appear [13].

In addition, as confirmed by the study of A. Anori and Y. Psycharis on the example of data from 13 regions of Greece for the 1995–2012 period, the contribution of different levels of education of the population to GRP is differentiated. The greatest positive contribution to GRP is made by secondary and higher education, while primary education has a negative impact on the dynamics of GRP. These differences were also typical for regions with high and low GRP levels. Moreover, in regions with a low level of income, the greatest effect on the formation of GRP is caused by secondary education, with the highest income – higher education [30]. Of course, in this case, the structure of the economy, where the human capital is implemented, is important. It is no accident that more and more empirical studies focus on the interconnection between the quality of human capital, the ability of the economy to create and reproduce innovations, and the economic growth.

[2] Let us remind that this concept explains the change of types of population reproduction, which is understood as a characteristic of this stage of social development unity of intensity of demographic processes (mortality, marriage, birth rate) and mechanisms of their social regulation. *Bol'shoj jenciklopedicheskij slovar',* gl. red. A.M. Prohorov. 2nd ed. Moscow: Bol'shaja rossijskaja jenciklopedija; Saint Petersburg: Norint. 2002. P. 341.

S. Barcenilla-Visu, C. Lopez-Pueyo, using data from 28 EU countries for the 1950–2011 period, the Benhabib and Spiegel model, and taking into account the time lag in return of the human capital, confirmed its impact on the rate of the economic growth in a country. Using the postulates of endogenous economic growth models, they found out that the quantitative increase of human capital increases productivity through the imitation of the innovation, while the improvement of the quality of human capital (the increase of the share of highly skilled workers) affects the ability to create innovations, providing the technological advantage of the national economy [23].

However, empirical estimates of the impact of changes in the technological structure of the economy and related changes of the quality of human capital on the growth of national and regional economic systems are ambiguous. For example, P.M. Gil, O. Afonso, and P. Brito used a modified endogenous growth model that takes into account the flexible structure of technical changes to identify structural relationships between the economic growth, technology structure (high-tech or low-tech), and employee skill structure (highly skilled or low-skilled). Based on cross-country data for Europe, the authors conclude that there is a statistically insignificant interconnection between studied parameters, except for a significant positive connection between the structure of employee skills and the structure of technology. According to P.M. Gel, O. Afonso, and P. Brito, it is caused by high barriers to entry into the high-tech sector, which limit mobility on the inter-country and national labor markets. They weaken the impact of the share of highly skilled labor on the rate of the economic growth of the national economy since enterprises in the high-tech sector of the economy are the only employers for highly skilled workers. Consequently, the improvement of the employees' skills structure does not automatically lead to the increase of the share of the high-tech sector along with the increase of the rate of the economic growth, as indicated in the European development strategy "Europe 2020: A strategy for smart, sustainable and inclusive growth", without policies aimed at reducing barriers to entry into this economic sector [31].

We would like to note that V.E. Gimpelson, analyzing the problems and prospects of using human capital in the Russian economy, also focuses on the need for changes in the country's economic policy from the supply and demand sides of labor. First, inefficient (unprofitable) firms, which are quite common on the Russian market, are not able to pay competitive wages to highly qualified employees. Secondly, in an unstable external environment, it is not profitable for firms to improve the skills of their employees, i.e. "to increase, in G. Becker's terminology, the level of specialized training and invest in the health capital of their employees" [12, p. 57]. Third, the current institutional environment in Russia primitives the structure of the Russian economy and does not promote the development of knowledge-intensive and high-tech activities. As a result, the structure of labor demand in our country is still dominated by simple performers of medium and low qualifications [32]. This conclusion is particularly important for our research, because it focuses on the fact that, in Russia, the contribution of the quality of human capital to the modern type of the economic growth is underestimated.

The results of empirical studies on the nature of the impact of income inequality on the economic growth (for example, [33; 34]), using different specifications of economic models according to different groups of

countries in various time periods, are also controversial. At the same time, as G.A. Cornia and J. Court showed that the depth of the differentiation of the population income is important. Scientists, using data from 73 countries for 1960–1990, concluded that the Gini Index value in the range from 0.25 to 0.40 has a stimulating effect on the economic growth, while the increase of income inequality constrains it at the value of 0.45 or higher [35].

We would like to note that, in the long discussion of economists, devoted to the analysis of the interconnection between the income inequality and the economic growth, scientists more often support the opinion on its negative nature, especially for the possibility of the economic development [3; 36].

Without further dwelling on contradictory interconnections between various social indicators of the economic development, we would like to note that Russian scientists also studied the parameters we analyze. Their results are generally unambiguous, because, unlike cross-country studies, the regional level of an analysis has a greater similarity of regions in terms of institutional conditions and the level of the socio-economic development.

Thus, R.M. Nizhegorodtsev and M.Y. Arkhipova used various modifications of econometric models to estimate the contribution of labor, capital, and scientific and technological progress (information) to the formation of GRP in a sample of 80 regions for 1996–2004.

Clustering of obtained data allowed the authors to reveal that these factors are not significant in most regions of the Russian Federation. It indicates the institutional conditionality of regional economic growth in our country [37]. We emphasize that the "labor" factor was assessed by the indicator of the total amount of wages of hired employees, i.e. qualitative characteristics of human capital were not considered.

K.V. Krinichansky and A.S. Lavrentiev applied the modified neoclassical model of R. Barro and H. Sala-i-Martin, presented in the OECD [cit. 38], to separately assess the structural policy priorities of Russian regions in the following areas: 1) education; 2) healthcare; 3) research and development, small business. The sample included data on 75 entities of the Russian Federation for 2002–2014. The conclusions obtained by K.V. Krinichansky and A.S. Lavrentiev, which are important for our research task, include the assessment of the contribution of education to the economic growth of Russian regions. A significant positive connection between the GRP impact of indicators such as employed population with different levels of professional education and budget expenditures on education were acquired in models. At the same time, the parameters for variables "investment in education" and "entry of young professionals with different levels of education into the labor market" were insignificant. The latter, as emphasized by K.V. Krinichansky and A.S. Lavrentiev, indicates the imperfection of labor market in regions of the Russian Federation [38]. However, it should be noted that, while the education sector was analyzed by the authors from the supply side and the formation of labor demand, in case of evaluating the health sector, individual health indicators, which allow drawing conclusions on the health capital's impact on GRP, were not assessed.

O.V. Michasova, using the Solow-Sven and Nelson-Phelps models, based on data for 2003–2010, established that the level of human capital stock is a significant factor for the development of Russian regions. The results of the study show the following: entities of the

Russian Federation are characterized by the existence of conditional convergence, i.e., it cannot be assumed that lagging regions will grow faster than leading ones. In addition, there is no "fast start" effect for the Russian economy, i.e. the lag of regions behind Moscow and Saint Petersburg reduces slightly over time [39]. These results allow us to draw a conclusion on the deepening of inter-regional differentiation in the development of the Russian economy, which is now being identified as one of the limitations in rates of positive economic dynamics.

At the level of Russian regions, the nature of the impact of income inequality on regional economic growth was also analyzed. For example, I.P. Glazyrina and E.A. Klevakina, using the hypothesis of S. Kuznets[3], which is based on data of Russian regions for 2000–2011, revealed that the majority of Russian regions (72 out of 82) are characterized by the increase of income inequality with the increase of GRP per capita. There is no statistically significant connection between GRP per capita and the Gini Index in eight regions: the Altai Krai, the Karachay-Cherkess Republic, Buryatia, Kalmykia, and Mari El republics, the Tyumen Oblast, Chukotka, and Yamalo-Nenets AO. Only in two regions – Moscow and Khanty-Mansiysk AO – the inequality decreases with the growth of GRP per capita [40]. The positive interconnection between the level of social inequality and the GRP of Russian regions was also confirmed by the results of other studies (for example, [33; 41]).

The presented review of the results of foreign and Russian scientists forms the theoretical and methodological basis of the author's research concerning the significance, nature, and magnitude of the contribution of the social component to the economic growth.

Data and the results of the econometric modelling of the impact of social processes on regional economic growth

The analysis was conducted using data from 14 entities of Privolzhsky Federal District (PFD) for the period from 1995 to 2015[4]. We would like to note that cost indicators were converted to 2015 prices to exclude the impact of inflation and to ensure comparability of their dynamics with the dynamics of other indicators expressed in natural measurers. 2015 was chosen as the basis year, since the latest data, published by statistical agencies on GRP per capita, were limited to the specified period at the time of the study[5].

The efficient feature in the model is GRP per capita since it allows quantitative measurement of the region's economy and the determination of the quality of regional socio-economic systems' development indirectly individually characterizing the level of each individual's well-being. The list of explanatory variables and their designations is presented in *table 1.*

In this study, data with panel structure will be reviewed. These data are two-dimensional arrays. One of dimensions has a temporal interpretation, and another one – a spatial interpretation. The choice of data type is determined by the purpose of the study and the presence of some advantages of its usage. Panel

[3] We would like to remind that this hypothesis assumes that inequality of income distribution in the process of the economic development initially grows, but then, as per capita income increases, it declines.

[4] *Regions of Russia. Socio-Economic Indicators. 2017: Statistics Collection.* Moscow: Rosstat, 2017. 1402 p.; *Regions of Russia. Socio-Economic Indicators. 2012: Statistics Collection*. Moscow: Rosstat, 2012. 990 p.; *Regions of Russia. Socio-Economic Indicators. 2007: Statistics Collection*. Moscow: Rosstat, 2007. 991 p.; *Regions of Russia. Socio-Economic Indicators. 2002: Statistics Collection*. Moscow: Goskomstat Rossii, 2002. 863 p.

[5] This methodology and database were used earlier to identify the current phase of the social cycle at the level of regional socio-economic systems [16].

Table 1. Variables for modeling

Factor	Designation	Characteristics	Units of measurements
Birth coefficient	fertility rate (FR)	Shows the ratio of the number of births to the average annual number of population per 1000 people	permille
Mortality coefficient	mortality rate (MR)	Shows the ratio of the number of deaths to the average annual number of population per 1000 people	permille
Life expectancy	life expectancy (LE)	Number of years that a person from the generation born would have to live on average, provided that, over the lifetime of this generation, age-related mortality remains at the level of the year for which the indicator is calculated	years
Morbidity coefficient	incidence rate (IR)	Ratio of the number of patients with a first-time diagnosis to the average annual number of population per 1000 people	permille
Fund coefficient	assets ratio (AR)	Ratio of average income of the population in the tenth and first decile groups	times
Number of srudents	number of students (St)	Number of students enrolled in programs of bachelor's degree, specialty, master's degree in educational institutions of higher education, designed for 10.000 people	per 10.000 people
Per capita monetary income of the population	per capita income of the population (Income)	Ratio of the amount of monetary income of the population per month to the average annual population	rubles
Employed with higher education	employed with higher education (EHE)	Share of employees with higher education in the total structure of employed population	%

data, as noted by B. Baltagi and A. Deaton: 1) contribute to the increase of the number of observations, therefore, it improves the efficiency of assessments; 2) allow tracking important socio-economic processes and phenomena that cannot be analyzed by time series and cross-sectional data separately; 3) eliminate the problem of aggregation shift; 4) allow tracking individual effects of objects in the time section [42; 43].

During this work, various model specifications were reviewed:

1) linear models with a dependent variable GRP per capita; 2) logarithmic models with a dependent variable "logarithm of GRP per capita" and logarithms of factor features. The second specification proved to be the most acceptable since the usage of a logarithmic specification is more justified when variables are censored by a zero on the left. Different model specifications were compared according to the Schwarz information criterion, the lowest value of which is observed in the best model.

The next step was the comparison of models with fixed and random effects and the selection of the most appropriate one (*Tab. 2*). We would like to remind that models with random effects are used when objects are selected randomly from a large general set of elements. The model with fixed effects implies that an individual effect could be correlated with variables. In this case, MLS-estimates will not be consistent [44]. The meaning of the effect is to reflect the influence of omitted or unobservable variables that characterize individual characteristics of studied objects which do not change over time [45].

In order to select between models with fixed and random effects, it is accepted to use the statistical Hausman criterion, the null hypothesis of which states that individual effects may be random, that is, a model with random effects is preferable [46]. According to *table 2*, the null hypothesis is not acceptable because the model with fixed effects is better (prob.= 0.00001). This conclusion seems logical because

Table 2. Simulation results for the dependent variable – the GRP logarithm

Indicator	Model with fixed effects		Model with random effects	
	Coefficients	Robust standard errors	Coefficient	Robust standard errors
const	44.758***	10.427	52.966***	9.781
ln(FR)	-1.028***	0.164	-1.203***	0.239
ln(MR)	-2.939***	0.399	-3.188***	0.433
ln(LE)	-9.043***	2.371	-10.589***	2.144
ln(IR)	-0.844***	0.202	-0.846***	0.205
ln(St)	0.658*	0.381	0.766*	0.415
ln(Income)	2.305***	0.315	2.190***	0.286
ln(EHE)	-0.861*	0.512	-0.964*	0.542
ln(AR)	-0.291	0.345	-0.195	0.316
Schwartz criterion	223.213		311.264	
Coefficient of determination	0.818		Statistics of Hausman test	418.37
Within coefficient of determination	0.731		prob. Hausman	0.00001
***, **, * – significance at 1, 5, and 10% levels, respectively.				

data on Russian regions cannot be considered the result of a sample study, and each object of observation (region) has its own individual characteristics that distinguish it from other entities of the Russian Federation. Models with included "time fixed effect" are also reviewed, but, according to Wald's criterion, the hypothesis on the absence of time fixed effects was not rejected.

The table shows that the results of the impact of social indicators, reflecting the development of regional socio-economic systems, on the growth of GRP are ambiguous.

First, for our country, which survived the second demographic transition and acquired reverse dependencies of the impact of fertility, mortality, and morbidity levels on the economic performance of Russian regions are logical.

Low birth level allows spending all region's resources on the production of goods without investing in children's upbringing. The level of women's participation in the production process does not substantially change, the dependency burden on working population does not increase, the level of families' income does not decrease. Consequently, the consumption level and the standards of savings do not decline [47; 48].

Within the reduction of population mortality, as it was noted before, the economic growth in developed countries is ensured by greater returns on the usage of human capital.

Lower morbidity level reduces direct costs of providing medical care and social assistance to ill people during the period of partial disability and the indirect cost in the form of GRP losses, caused by the loss of disability due to illness, the absence of people at work, and (or) the decrease of labor productivity [49; 50].

For example, according to A.V. Konceva, O.M. Drapkina, Ju. A. Balanova, A. Je. Imaeva, E.I. Suvorova, M.B. Hudyakov, sole economic damage from cardiovascular diseases in Russian in 2016 was 2.7 trillion rubles (3.2% of GDP)[6] [51]. At the same time, indirect costs account for more than 90% of the damage structure.

However, the question arises why, in such conditions, the economic growth in Russian regions is accompanied by the decrease of life

[6] The authors' calculations also consider the premature mortality among economically active population as one of components of the indirect cost of the "national burden of disease" of Russian population.

Table 3. Comparative analysis of main demographic indicators in Russia and other countries

Indicator	RF data	Countries with similar indicators to the Russian Federation
Birth rate, permille	12.8	Australia (12.9); Ireland (13.0); New Zealand (12.6); Chile (12.5); Iceland (12.1)
Mortality rate, permille	12.7	Central African Republic (12.4); Chad (12.2); Nigeria (12.0); Hungary (12.5); Georgia (12.8)
Life expectancy, years	72.29	Bangladesh (72.15); Venezuela (72.13); Grenada (72.39); Libya (72.70); Republic of Cape Verde (72.70)
According to: *World Population Prospects 2019.* Available at: https://population.un.org/wpp2019/Download/Standard (accessed 11.11.2019).		

expectancy, whereas, according to previous studies, countries that experienced the second demographic transition should be characterized by a reverse dependency. In our opinion, this paradox can be explained by a phenomenon called the "Russian cross", which characterizes the steady excess of mortality rates over birth rates on a scale that is hardly compensated (or not compensated) by external migration[7] [52]. We would like to note that such trends are not natural for other countries. At the same time, if a value of the birth rate coefficient in Russia is at the level of developed countries, a value of life expectancy largely corresponds to indicators of developing countries (*Tab. 3*).

The gap in life expectancy in Russia and developed countries is caused by differences in the mortality rate of population, especially in working age. According to A. G. Aganbegyan, with a comparable age structure, the mortality rate in Russia exceeds European numbers by 600 thousand people per year. At the same time, the mortality rate among people of working age in the Russian Federation is 2.5 times higher than in Western Europe, which, according to Aganbegyan's calculations, is more than 300 thousand people a year. If we take into account "that one employee produces a GDP of more than 50 thousand US dollars per year in PPP terms (about 3 million rubles) or, at the market rate, he produces goods which are equal to almost 1.5 million rubles", then the reduction of the number of deaths among working-age population to European countries' indicators may provide an annual GDP growth equal to 450 billion rubles [53, p. 15]. Moreover, the intensification of mortality rates among working age people is typical for men. So, according to UN estimates, there are more than 7 million "lost men"[8] in Russia. If we consider that the cost of human capital per person in Russian prices is equal to, approximately, 12 million rubles [53, p. 15], losses of the Russian economy from male super mortality alone amounted to 84 trillion rubles. It is no accident that WHO considers health as a social institution that can act as a social prerequisite for the economic growth.

Based on dependencies of the impact of life expectancy on the dynamics of GRP we obtained and the review of research results presented before, we may conclude that Russian regions continue to develop primarily due to other factors, and the contribution of human capital to GRP is underestimated. The confirmation of this conclusion is the reverse dependency between the number of employees with higher education in the region's economy and GRP.

[7] We would like to note that this concept has also been used by foreign scientists. Thus, D. Coleman and J. Goldstein use the term "Russian cross" in their report "On the impact of demographic factors on global conflict in 2019–2035".

[8] *Human Development Report 2007/2008.* Moscow: Whole world, 2007. Available at: http://www.on.org/russian/esa/hdr/2007 (accessed 16.11.2008).

In addition, let us note that a factor called "a number of students enrolled in bachelor, specialist, and master's programs in institutions of higher education" was not significant in the obtained model. Clearly, it, on the one hand, indirectly confirms that Russian education system is not significantly modernized, and the training of specialists still does not consider requirements of employers. Most of all, these trends are typical for the system of higher professional education. As A. Zudina emphasizes, it is no accident that among unemployed people aged 15–24 years, who belong to so-called NEET group (Not in Employment, Education or Training), most of them have higher professional education [54]. On the other hand, the situation when graduates of educational institutions cannot immediately find a job after their graduation, and they are not in demand due to the lack of experience indicates the imperfection of the Russian labor market.

The direct dependency between the dynamics of the population's monetary per capita income and GRP obtained in the model is logical. This is the third most important parameter that affects the formation of GRP. The increase of the population's per capita income by 1% leads to the 2.31% increase of GRP. In addition, there is a known multiplication effect of increasing the population's income. It leads, first, to the increase of the quality of individuals' human capital due to large investments in health and education capital, the possibility of its recovery. Second, it leads to the subsequent growth of the regional economy due to increasing consumption of goods and services.

In our opinion, it is necessary to consider reasons for the absence of a statistically significant impact of the level of income inequality on the explained GRP variable. However, we would like to note that the reverse dependency between these two variables, which we obtained, was confirmed by the results of other studies.

In general, if we follow the logic of our previous works [16][9], it turns out that greatest problems, based on the results of econometric modeling, are a group of resulting indicators that form the potential for subsequent economic development of regional systems. It included the birth rate, life expectancy, and a number of students enrolled in bachelor, specialty, and master's programs. The nature of the impact of these indicators on GRP, according to the parameters obtained in the author's model, except for the birth rate, does not correspond to developed countries' trends. Therefore, they may become significant barriers to the progressive development of the Russian economy in the future.

Conclusions

The comprehensive analysis of the results of econometric modeling of social processes' impact on the dynamics of GRP, based on data from 14 entities of the Privolzhsky Federal District for the period from 1995 to 2015, allowed us to reveal causes, scope, and consequences of the underestimation of human capital as the main factor of the development of the Russian economy at the current stage, despite strategic priorities declared by the President of the Russian Federation in 2016[10].

First, significant losses of GRP caused by premature deaths among population, especially

[9] According to the author's research methodology, social indicators of modern economic growth, presented in table 1, were divided into groups: 1) indicators that ensure the economic growth on a new technological structure of the economy; 2) indicators that characterize social processes in society; 3) resulting indicators that form the potential for subsequent economic development of regional systems.

[10] Presidential Address to the Federal Assembly, dated 01.12.2016. Available at: http://kremlin.ru/events/president/news/53379 (accessed 25.11.2019).

deaths of working age people, disability due to illness, and (or) reduced labor productivity are partially compensated by the intensification of the usage of other production factors.

Second, the structure of the economy that has developed in Russian regions is not based on common informatization, innovatization, capitalization of labor resources, service-based production, knowledge-intensive, technetronic renewal and transformation of productive forces [55]. Therefore, it does not create conditions for the demand for highly qualified human capital.

Third, the inertness of the education system and the imperfection of the labor market limit the timely renewal of human capital in enterprises due to the influx of graduates from bachelor, specialist, and master's programs. As the result, the human capital of graduates is devalued, investments in human capital do not pay off, an additional burden on the working population is created, and the unemployment rate grows. In the end, everything will lead to the reduction of GRP in Russian regions and GDP.

Obtained dependencies, according to the results of foreign studies, do not correspond to the development trends of countries that have experienced the second demographic transition and have a high level of education among population. In the future, the extension of these sets in the formation and usage of human capital will significantly limit the possibility of Russia's transition to the knowledge economy, which was announced by Expert Council under the Government of the Russian Federation while defining priorities of the Strategy of the socio-economic development of Russia until 2030[11]. In addition, in such conditions, as we have shown earlier, we may only expect the increase of the productivity through the imitation of innovations that do not provide the technological advantage of the national economy.

The proposed econometric model for assessing the impact of social processes on the dynamics of the economic growth in regions of the Russian Federation actually allowed us to determine medium-term priorities of regional socio-economic policy, depending on the level of their impact: 1) reduction of the mortality rate among population, especially among working age people; 2) increase of the population's per capita income; 3) restructuring of the regional economy toward the development of knowledge-intensive and high-tech activities, ensuring the formation of a stable demand for highly qualified human capital; 4) reduction of the level of morbidity among population; 5) improvement of the institutional structure of regional labor markets in order to reduce unemployment among university graduates.

It seems that obtained contradictory dependencies between indicators of mortality and life expectancy and GRP per capita, as well as the lack of such studies within all entities of the Russian Federation, actualize further study of the impact of these factors on regional economic growth. It should be noted that these variables have the highest elasticity coefficients, i.e. the degree of its impact on GRP, in comparison with other social indicators, is more significant.

Restraining factors of the regional economic growth not only constitute a hidden reserve of the development of Russian economy and its regions but these factors are also a necessary condition of its sustainable development in the future.

[11] *"Strategy–2030": Defining goals and priorities.* Available at: https://open.gov.ru/events/5514805/ (accessed 28.11.2019).

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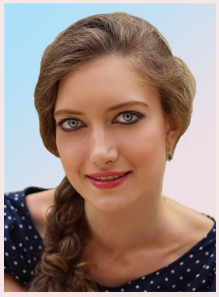
Instruments and Principles of Reallocating Budgetary Resources in the Region*



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Abstract. The article is devoted to studying the reallocation of budgetary resources at the intraregional level. The author has made a hypothesis that the existing instruments and principles of reallocating budgetary resources in the region hinder the effective use of the local budgetary system's capacity for developing the fiscal capacity of the entire region. The work is aimed at justifying the key principles and instruments of the modern public regional policy in the field of the intraregional reallocation of budgetary resources for developing the region's fiscal capacity. The Russian regions have become the object of the study covering the period from 2005 to 2018. In order to reveal statistical regularities, the researcher has used general scientific methods based on the official data from the Federal Treasury, the Ministry of Finance, Rosstat, regional authorities and local government bodies. The works of leading Russian and foreign scientists have composed the theoretical basis of the study. In the course of the research the author has identified the trends of budgetary reallocation in the region, as well as proposed the directions of improving its efficiency, including the set of instruments for strengthening the income basis of local budgets and the research and methodological justification for using the budgetary reallocation instruments in the region. The scientific novelty of the results includes the justification of applying the instruments and principles of the modern public regional policy in the field of the intraregional reallocation of budgetary resources, which, unlike the existing ones, rely on the effective use of the local budgetary system's capacity

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for developing the fiscal capacity of the entire region. The materials of the present article can be used in the educational sphere, as well as in the activities of public authorities and local government bodies.

Key words: municipal development, local government, municipal units, stimulation, fiscal federalism, equalization, differentiation, fiscal capacity, reallocation.

Introduction to agenda. Developing the fiscal capacity of regions according to the principle of synergetic multiplicative effect greatly depends on using the capacity of municipal units. Indeed, in developed countries sustainable municipal growth, which comprises increasing the efficiency of using territories' capacity, including the budgetary one, has been recognized as the most important driver of economic growth [1–4], allowing to find the integrated solution of solving important tactical and strategic tasks.

The high relevance of developing the local economy and municipal finance within the unprecedented era of rapid urbanization has been stressed in the new Urban Development Programme of the UN General Assembly up to 2030 [5]. In his address to the Federal Assembly in 2018 the President V.V. Putin has reminded about the need of solving the economic growth issues in Russia through municipal development. A.D. Nekipelov, the academician of the Russian Academy of Sciences, has noted that it is necessary slightly to push the development of economy through restructuring all mechanisms of its functioning both at the macro- and micro-levels [6]. In the studies of many national and foreign scientists [7–10] the role of micro-level is assigned to municipal units as the fundamental element of the state's administrative-territorial system. The reason for this is that local government, firstly, is the population's way of adapting to changing political, economic, social and other living conditions, and, secondly, according to the subsidiarity principle, allows to take into account the resources, conditions, particular characteristics of territories, needs and interests of people for the most effective and optimal solution of the state's tasks.

No wonder that the municipal level is responsible for creating and maintaining conditions contributing to the reproduction of human capital, as evidenced by concentrating in local budgets more than 60% of expenditures for the social sector (pre-school and general education, physical education and mass sports, social security of the population).

It is quite obvious that municipal development should be based on the growth of financial resources, first of all, on budgetary ones. Through the inter-budget federal and regional policies the municipal development priorities are set and the optimal stimulating and support instruments are identified. Within the conditions of fiscal federalism, the solution of overwhelming number of the region's socio-economic tasks, in particular, ones of a strategic nature, is possible only by joining efforts of different management levels. According to the experience of developed countries, in the stable market economy inter-budget relations contribute to forming fairly independent regional and local budgets, taking into account territorial needs [11]. The special significance regarding the influence of budget revenues allocation parameters along the vertical management on the fiscal capacity has determined the *relevance* of the study. Within the research the author has proposed a *hypothesis* that the existing principles of reallocating budgetary resources in the region hinder the effective use of the local budgetary system's capacity for developing the fiscal

capacity of the entire region. Therefore, justifying the instruments and principles of the modern public regional policy in the field of the intraregional reallocation of budgetary resources for developing the region's fiscal capacity is the *aim* of the study. In order to achieve it, it is necessary to identify trends and propose directions for improving the efficiency of budgetary reallocation in the region.

Theoretical aspects of reallocating budgetary resources at the regional level. The value created in the economy passes the stage of primary allocation according to the laws of material production and objective market needs. Subsequently, the imperative state influence, which more clearly outlines the emerging secondary reallocation, referred as the budgetary one, is added to the process of allocating the created value. As N.A. Istomina rightly remarks [12], compared to the primary one, the budgetary allocation can be characterized not only by planning, forecasting and payments control, but also by establishing the goals and directions of allocation, and the size of reallocated funds, etc. The majority of researchers share the same opinion that budgetary reallocation should be considered from the position of using budgetary opportunities in accordance with public needs, priorities, statutory functions and powers. Therefore, this indicates that the inefficient reallocation of budgetary resources between the region and municipal units has a negative impact on the multiplicative extension of fiscal capacity of the entire region.

Various aspects of intraregional budgetary reallocation are studied in academic literature. Some papers (for example, the works of A.V. Starodubtsev, W. Nordhaus, I. Marques, E. Nazrullaeva, A. Yakovlev, S. Ansolabehere, J.M. Snyder, M. Vaishnav, N. Sircar [13–17]) are devoted to the impact of electoral cycles and political priorities on budget resources allocation. In others [18–20] the attention is paid to the management of territorial development through the budgetary reallocation instruments, including budget investment, financial aid and own (tax and non-tax) revenue sources. Statistical estimates testify that budget investments comprise only 1–5% of local budget expenditures, while inter-budget transfers often generate over 60% of local budget revenues, the size of which directly depends on the volume of own revenues. The present circumstance increases the relevance of studying the last instrument of budgetary reallocation.

It is worth noting that in most developed countries the municipal units have formed mainly under the influence of market forces; consequently, budgetary reallocation has served to satisfy the increasing needs of society and production. In centrally-controlled economy of the USSR, the formation of municipalities took place under the conditions of restrictions on industrial construction according to the general settlement scheme, which in a number of cases led to inertia in developing the industry and reduced the possibility of its progressive transformation [21].

Started to change after the collapse of the USSR, the budgetary reallocation at the intraregional level in Russia remained non-formalized up to September 1997[1]. The need of stimulating not only regional, but also municipal development was legislatively confirmed in 2001 with the adoption of the Programme for Budgetary Federalism Development up to 2005. Modern basics of the local budgetary system functioning have been established since 2009 (in a number of pilot regions – since 2006) after the enactment of the Federal Law dated October 06, 2003

[1] Up to the adoption of the Federal Law no. 126-FZ *"On Financial Fundamentals of Local Government in the Russian Federation"*, dated 25.09.1997.

No. 126 "On General Principles of Organizing Local Government in the Russian Federation". The main directions of the Strategy for Spatial Development of the Russian Federation up to 2025 have started to be implemented only since 2019.

Main results and their explanation. As previously noted, the current local budgetary system taking into account different types of municipal units dates back to 2006, this year has become the initial point of the study. It has been marked by some instrumental adjustments in the budgetary reallocation within the regions, which expected to change the number of local taxes (from 5 to 2), and the reduction in the rate of allocations according to certain federal and regional taxes. Thus, the payments for the use of natural resources, income tax allocations, as well as the part of standards on the personal income tax has been transferred from budgetary sources of different types of municipal units to higher budgets (*Table 1*).

During the transition period of the municipal reform (2003-2009), such measure seems quite appropriate in terms of smoothing the fiscal capacity's differentiation of municipal units, which are extremely uneven according to the distribution of productive forces and the level of economic development. However, further strengthening of the centralization process, especially relating to the standards of allocations from the budget-forming tax on personal income, has just reduced the financial stability of local budgets under the weak diversification of the tax structure (*Table 2*). Unfortunately, significant changes in fiscal

Table 1. Changes in the list of tax sources in local budgets of the Russian Federation after the municipal reform, %

Tax revenues	Before the reform	After the reform		
		Municipal districts	Settlements	Urban districts
Income tax (rate)	7	0		
Personal income tax	50–70	20	10	30
Gambling tax	50	0		
Vodka excise tax	35	0		
Corporate property tax	50	0		
Personal property tax	100	100	100	100
Land tax	100	100	100	100
Payments for the use of natural resources	65–80	0		
Unified tax on imputed income	45–75	90	–	90
Payments for negative impact on the environment	54	40	–	40
Compiled by: laws on the federal budget for the period of 2003–2007.				

Table 2. Dynamics in the structure of tax sources in local budgets of the Russian Federation, %

Tax	2004	2015	2018
Personal income tax	39.89	62.28	64.07
Property taxes	12.43	19.02	17.70
Total income tax	5.11	12.07	12.64
Excise tax	2.17	2.81	3.00
Income tax	32.83	0.93	0.73
Stamp duty	0.65	1.82	1.67
Water tax / Taxes and charges for the use of natural resources	0.36	–	0.18
Sales tax (calculated per 2003)	0.37	–	–
Gambling tax	0.35	–	–
Gift tax	0.16	–	–
Calculated by: data from the Federal Treasury.			

legislation, statistical calculation methods and budgetary classification do not give an opportunity to make an accurate assessment of structural shifts in the inter-budget allocation of revenues. But even the approximate estimates allow drawing firm conclusions about the existence of the centralization trend.

Comparing own revenues of local budgets with the GRP value has shown that the smallest part of gross formation belongs to municipal units. Thus, the share of municipal units' own revenues in relation to the GRP in the Vologda Oblast has decreased from 4.9 to 2.8%, and the share of tax local revenues in the structure of the consolidated budget in the region has reduced from 66 to 18% (*Table 3*).

The twofold increase of transfer payments has become the result of reducing tax sources of local budgets. If, according to the data from the Federal Treasury, in 2003 their share did not exceed 26%, then during the transition period of the reform (2006–2009) it increased up to 56%, and starting from 2009 it has been steadily comprising more than 60%.

It should be noted that the financial base of the settlement level is mostly forming by reallocating the part of income sources from municipal districts. As a result, the budgetary indicators of municipal districts have changed significantly. Backing off from the average country values, let us give a specific example regarding the one of pilot regions moved to the implementation of the new municipal principles starting from 2006, not from 2009.

Own revenues of all municipal districts of the Vologda Oblast have decreased by three times compared to the preliminary year, and the fiscal capacity of the population with own revenues has reduced by 65% (*Table 4*). If in 2005 the fiscal capacity indicator of districts in the Vologda Oblast per resident mainly consisted of own revenues, then in 2006, on the contrary, it became largely dependent on the value of inter-budget transfers.

Subsequently, the practice of reallocating budgetary sources among the types of municipalities has been repeated many times. However, the growing need in equalizing fiscal capacity under the conditions of budgetary crises has prevalently become the prerequisite for the intraregional budgetary reallocation in the future.

Table 3. Allocation of own and tax revenues between the budgetary system's levels as exemplified by the Vologda Oblast

Year	Allocation of own revenues, % to gross regional product		Allocation of tax revenues, % to consolidated budget	
	Regional budget	Local budgets	Regional budget	Local budgets
2004	9.4	4.9	34	66
2005	7.9	4.2	67	33
2006	10.7	3.0	82	18
2007	10.9	3.8	78	22
2008	11.7	3.9	79	21
2009	8.9	4.2	72	28
2010	9.8	3.8	71	29
2011	9.1	3.6	76	24
2012	9.2	3.3	80	20
2013	9.2	3.1	79	21
2014	9.0	2.9	79	21
2015	9.0	2.8	79	21
2016	8.9	2.8	80	20
2017	8.8	2.8	82	18
2018	8.8	2.8	82	18
Calculated by: data from the Federal Treasury and Vologdastat.				

Table 4. Budgetary situation in municipal districts before and after the reform

Name	Own revenues per one resident, rubles			The share of own income in revenues,%		
	2005	2006	2006 to 2005, %	2005	2006	2006 to 2005, %
Municipal districts of the Russian Federation	5689	1903	33	62.3	17.1	27
Municipal districts of the Vologda Oblast, including:	5444	1885	35	67.6	16.0	24
Ust-Kubinsky	3777	3298	87	42.3	20.0	47
Sokolsky	5655	2499	44	66.0	26.5	40
Mezhdurechensky	5069	1504	30	55.8	21.5	39
Kirillovsky	5180	2569	50	64.3	20.7	32
Babaevsky	7719	2616	34	78.5	21.5	27
Belozersky	6235	2877	46	81.0	21.7	27
Chagodoshchensky	6527	2363	36	64.1	16.9	26
Kharovsky	4239	1743	41	60.8	15.1	25
Gryazovetsky	6806	2264	33	93.7	22.7	24
Sheksninsky	5182	2034	39	83.5	20.0	24
Syamzhensky	3916	1632	42	52.6	11.9	23
Kichmengsko-Gorodetsky	2924	1176	40	46.5	10.5	23
Tarnogsky	3152	1212	38	42.5	9.3	22
Velikoustyugsky	6647	2009	30	81.5	17.7	22
Verkhovazhsky	3227	1168	36	49.1	10.6	22
Vologodsky	4875	1619	33	78.5	16.4	21
Nikolsky	2587	1002	39	46.1	9.4	20
Cherepovetsky	7646	2001	26	100.0	20.2	20
Vozhegodsky	3668	1302	35	49.8	9.9	20
Kaduysky	12183	2570	21	100.0	19.8	20
Totemsky	7531	2133	28	87.7	16.5	19
Vashkinsky	4134	1328	32	47.0	8.8	19
Ustyuzhensky	3148	1256	40	50.3	9.1	18
Vytegorsky	8487	1744	21	100.0	17.2	17
Nyuksensky	7650	1932	25	78.4	13.1	17
Babushkinsky	3367	1148	34	58.1	9.7	17
Calculated by: data from the Federal Treasury and Rosstat.						

As far as more than 60–70% of tax revenues of local budgets have traditionally been concentrated in the treasury of cities, the mechanism of reallocating their budgetary sources has been exposed to new anti-crisis adjustments[2]. In 2012, the minimum standards of the personal income tax payments to the budgets of urban districts have been reduced from 30 to 20%, in 2014 – even up to 15%. Due to the fact that not all regional authorities have established the minimum standard for urban districts, geographically even for the Northwestern Federal District there has been a significant gap in the dynamics of tax revenues (*Table 5*).

The role of the personal income tax in forming own budgetary resources of urban districts in Russia has decreased from 64 to 58%, despite the fact that indicators of socio-economic development showed stable growth. For example, the average wage in Vologda has increased by 45%, but the share of tax in revenues has decreased by 18%. Inter-budget

[2] Federal Law no. 361-FZ *"On Making Amendments to Certain Legislative Acts of the Russian Federation"*, dated November 30, 2011 (edition dated 29.12. 2017); Federal Law no. 252-FZ *"On Making Amendments to the Budgetary Code of the Russian Federation and Certain Legislative Acts of the Russian Federation"*, dated 23.07.2013.

Table 5. Dynamics of the personal income tax returns to the budgets of urban districts, % to the previous year

Territory	2012	2013	2014	2015	2016	2017	2018
Russian Federation	104.1	111.5	80.2	100.5	104.3	106.2	117.5
Northwestern Federal District, including:	95.6	105.5	86.1	104.3	98.0	109.5	113.8
Murmansk	105.5	109.9	80.2	108.0	108.4	108.0	113.1
Kaliningrad	113.3	91.8	100.9	99.5	107.0	105.0	112.6
Pskov	103.6	98.2	100.2	97.6	104.8	108.4	106.8
Arkhangelsk	97.0	108.3	92.6	101.4	85.3	126.4	107.2
Syktyvkar	114.8	112.2	71.8	100.9	89.9	105.1	113.7
Petrozavodsk	83.6	111.8	76.5	97.5	104.7	102.2	115.8
Vologda	53.9	109.5	79.9	113.2	91.1	109.1	149.5
Veliky Novgorod	75.5	111.5	77.7	96.4	105.5	102.5	107.7
Calculated by: data from the reports of the Federal Treasury; the reports on budget implementation in urban districts; Rosstat; the Federal Tax Service.							

adjustments have led to the fact that out of 5.6 bil. rubles collected from employees of enterprises and organizations of Vologda, only 900 mil. rubles remained in the city budget. In total, during the period of 2011–2016 the similar losses of the city treasury comprised almost 4 bil. rubles, which was equivalent to 34% of tax revenues. In order to solve the issues of local importance, city authorities were forced to increase the debt burden from 13 to 74% and to allocate 618 mil. rubles for maintaining bank credits. Analyzing the trends of the budget's tax autonomy on the budget-forming tax and the budgetary balance of the city confirms the interconnection of these indicators (*Fig. 1*).

Figure 1. Correspondence of ratios characterizing the return of the personal income tax into the budget and the size of the budget deficit/surplus of Vologda in 2005–2020

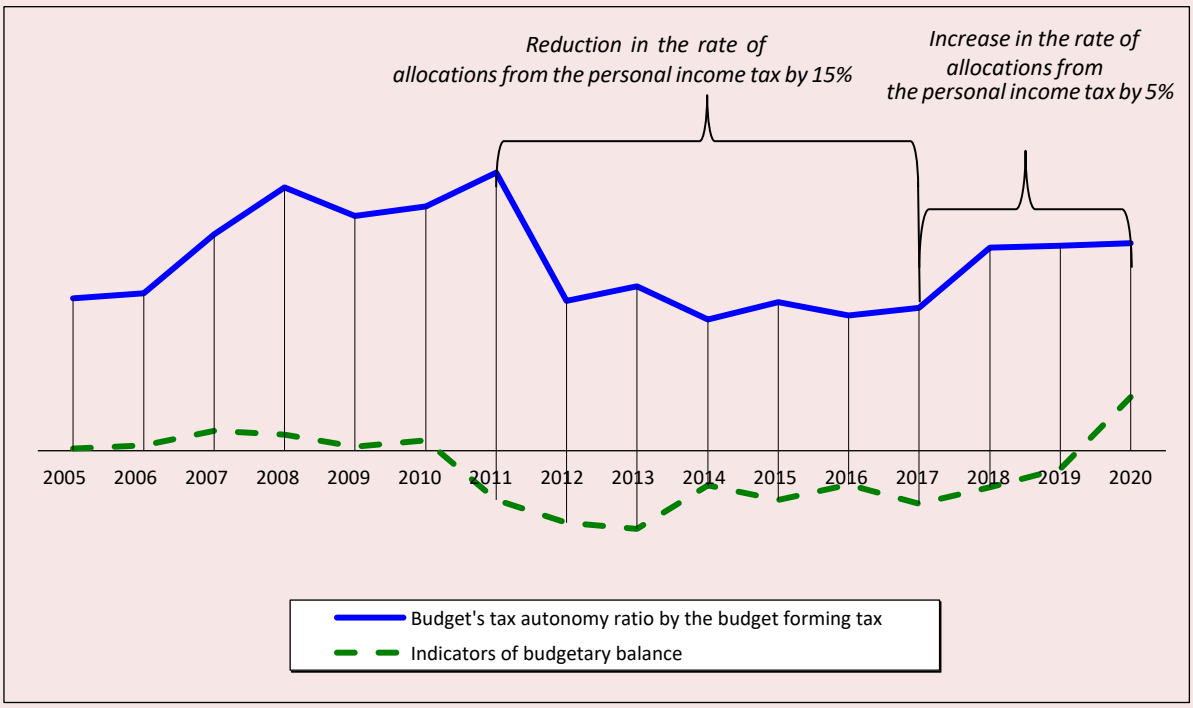


Table 6. Ratio in own revenues and expenditures of local budgets of the Russian Federation

Year	Ratio in own revenues and expenditures, bil. rubles	Ratio in own revenues and expenditures, %
2004	-2.2	75.4
2005	-2.3	77.6
2006	-4.2	65.8
2007	-7.2	45.8
2008	-8.0	53.7
2009	-7.7	59.5
2010	-6.5	57.5
2011	-8.1	55.6
2012	-9.9	53.5
2013	-7.0	63.5
2014	-7.9	64.1
2015	-8.6	65.7
2016	-8.4	63.2
2017	-7.7	61.2
2018	-7.9	62.9
Calculated by: data from the Federal Treasury.		

The consequences of the budgetary reallocation of the key tax for urban districts have become the decrease of one third of real[3] budgetary expenditures, the break of the trend in exceeding own revenues over financial assistance since 2014, and the reduction of the balance indicator (*Table 6*).

In the end, it influenced the abilities of city authorities to use the fiscal capacity as a tool for improving the population's living standards and quality of life. Some studies [22–24] confirm that the possibilities of modernizing the economy and social sphere are growing with the strengthening the fiscal capacity of territories, but its extremely unstable level, shown in the *figure 2*, cannot contribute to the solution of these tasks so far.

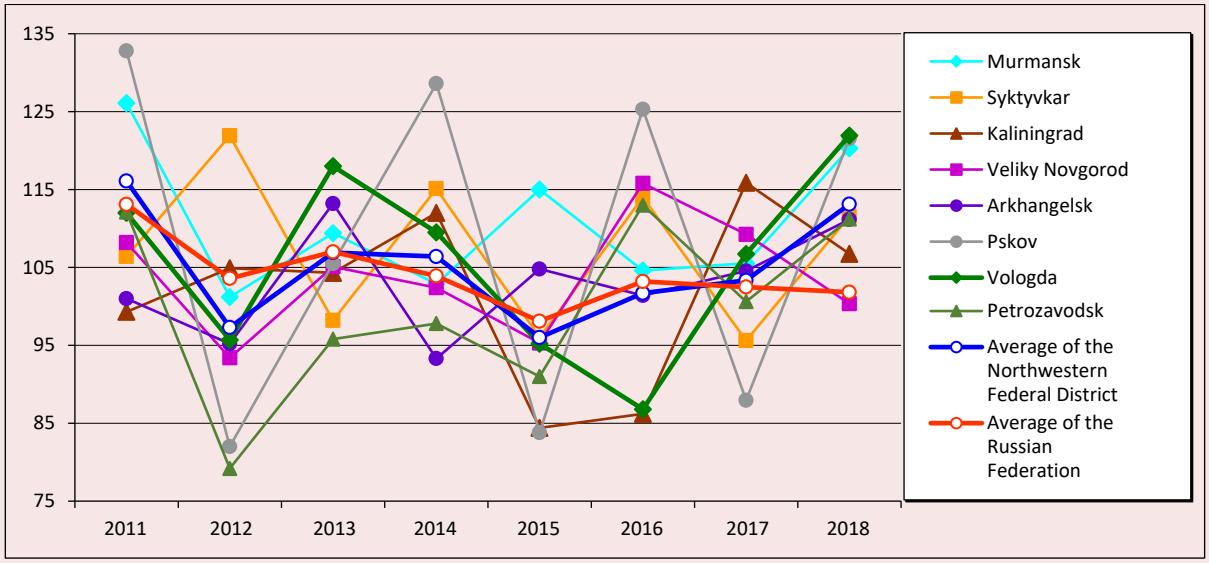
As for the situation in settlements, statistical data are still showing the formal operating among the most budgets. The deficit of own income sources for the performance of expenditure powers is offset by the system of inter-budget transfers (in a number of regions of the Russian Federation more than 95%).

The domestic experience of reallocating budgetary resources within the region shows that the evolution of inter-budget relations at the local level satisfied the principles of income centralization, expenditure decentralization and the priority of equalizing fiscal capacity over stimulating the development of local territories. Following these principles has not allowed regional authorities to reduce the burden of regional budgets significantly during the entire observation period, which is related to the need for free financial assistance to municipal units. Herewith, a large share of transfers has been passed to the execution of delegated powers rather than own ones, and the share of issues regarding the local budgetary balance issues solved at the expense of the banking sector has increased (*Table 7*).

The main conclusion, which follows from the above-mentioned problems of budgetary reallocation in the regions of the Russian Federation, lies in the inconsistency of used instruments to the current state of the local budgetary system. Despite its deterioration, there are a number of trends in reallocating budgetary funds within the region, permanently supported by public administration instruments.

[3] Calculated by the author according to the reports on budget implementation in urban districts with inflation taken into account.

Figure 2. Dynamics in income fiscal capacity of urban districts of the Russian Federation per capita, % to the previous year



Calculated by: data from the reports of the Federal Treasury; the reports on budget implementation in urban districts; Rosstat.

Table 7. Volume of inter-budget transfers to municipal units in the Russian Federation, %

Year	The share of inter-budget transfers in expenditures of the region's consolidated budget	including executing the expenditure powers of the upper levels, % to inter-budget transfers	The share of bank loans in own revenues of local budgets
2004	33.0	42.8	1.5
2005	35.9	58.5	1.4
2006	41.0	50.1	1.3
2007	42.1	51.1	1.9
2008	37.5	49.1	1.9
2009	36.3	48.7	3.6
2010	41.3	52.9	9.5
2011	40.1	54.5	18.4
2012	38.4	49.5	26.2
2013	36.3	63.6	30.3
2014	39.5	67.9	40.5
2015	40.0	65.4	41.1
2016	31.8	60.2	48.7
2017	30.2	61.9	47.4
2018	30.9	62.0	43.8

Calculated by: data from the Federal Treasury.

1. The instruments of the budgetary reallocation in the region are based on the principle of equalization "from the wealthy people to the poor ones" without building the mechanisms of compensating the falling out income sources. The same practice was used in 2005–2009 regarding the municipal districts and has been used since 2012 till the present moment concerning urban districts.

2. Strategic priorities for spatial development of the Russian Federation up to 2025 and the main directions of the fiscal policy up to 2022 (for example, regarding the cities received the need for strategic development without accompanying budgetary instruments) are weakly correlated.

3. The approach to the budgetary reallocation is maintained, in which the expected objective advantages of developing the certain types of municipal units (for example, the administrative factor, concentration of economic, labor and other resources) have become the matter not only for narrowing the tools for attracting budgetary resources at no charge, but also income sources for implementing the equalization function not in addition to the function of stimulating territorial development, but in contrast with it.

All mentioned above allows to make a conclusion that the modern public budgetary policy in the field of reallocating budgetary resources within the region is characterized by fragmentation of budgetary reallocation instruments, disagreement in legal and regulatory framework and actions of different management levels, as well as by insufficient accounting of budgetary trends of municipal units and their fiscal capacity. In turn, it does not initiate the multiplier effect of developing the fiscal capacity of the region with using the potential of the local budgetary system. Herewith, the chilling effect of budget reallocation within the region creates serious barriers for developing the fiscal capacity of Russian territories. The disordered short-term targeted processes of shifting budget funds from some types of municipal units to others only exacerbate the general negative trend.

Taking into account the specified circumstance and the results of the study, we consider that the following measures should be essential for improving the efficiency of the budgetary reallocation within the region:

1. On the one hand, it is necessary to propose the tools for strengthening the income basis of local budgets (regarding the personal income tax, tax revenues from the property complex, small business taxation).

2. On the other hand, it is necessary to strengthen the research and methodological justification of using the reallocation budgetary instruments (concerning the regular accounting of the dynamics in development of the center and periphery).

Instruments regarding the personal income tax

About 50% of local budget's own revenues comprise the personal income tax. Due to the tax legislation, it is a federal tax, but the powers of its reallocation have been transferred to regional authorities. According to the revealed trends, its inter-budget allocation has become the most unstable one in the tax system. The extremely high dependence on volatility of this source disrupts paying capacity, sustainability and, consequently, security of the local budgetary system.

Due to the European Charter on Local Government, ratified by the Russian Federation in 1998, the financial resources of local government bodies must be commensurate with the powers granted to them by the Constitution and the law. There is no denying that municipalities at the district and settlement levels will not be able to "survive" without stable income sources. At the same time, the practice of personal income tax deductions, permanently reallocated from some types of municipal units to others, creates the problems of balance, debt and social issues, etc. The question is what part of the collected revenues should be taken out of municipal units for their transfer to the regional budget.

The problem regarding the territorial placement of the personal income tax, which is still relevant, should not stay unmentioned. A long time ago foreign countries carried out the tax reform of reallocating the personal income tax from the taxpayer's workplace to the place of his residence. The obvious arguments in favor of this instrument are the lack of financial resources for the development of infrastructure and the provision of social services to the population guaranteed at the place of residence, the falling out of tax revenues due to the provision of tax deductions for those taxpayers whose place of residence does not coincide with the workplace.

The experience of Germany testifies the possibility of the further reallocation of tax payments to the budget of the place of residence after their initial payment at the workplace [25]. In Russia there is no legal framework for it, but the organizational framework with the existence of taxpayer identification numbers (TINs) and the powers of the Pension Fund to monitor wage contributions from each worker contributes to implementing such instrument of strengthening the income basis of peripheral municipal units.

Instruments regarding tax revenues from the property complex

Local taxes (the personal property tax and the land tax) make an insignificant contribution to the municipal treasury – less than 17% of own revenues. If we refer to foreign comparisons, then the real property tax exists in approximately 130 countries around the world. In the local budgets of some federated states it is the main item of tax revenues: in the USA – about 70–75%, in Canada – up to 80%, in some states of Australia – more than 90%. The potential of property taxes, the particular value of which is their independence from external economic conditions, is quite weakly used in Russia. It is connected both with problems of their inter-budget allocation and with problems of accounting the tax basis, which reduces the level of tax collection. Herewith, tax collection has the direct influence on the liquidity of the budgetary system and minimization of the risk regarding the lack of free funds for timely payments on debt servicing and redemption. According to the Federal Tax Service, the debt on local tax payments to the budgets of municipal units of the Russian Federation as of January 01, 2019 has comprised nearly 92 bil. rubles, or 44% of the received volume.

The land tax remains rather difficult for performance and the insignificant source of local revenues in the Russian Federation. The Tax Code gives its marginal tax rates, under which the bodies of municipal units can differentiate the amount of tax depending on the categories of land or the permitted use of the land plot (from 0.3 to 1.5%). However, the minimum limit is not defined, which indicates the possibility of a tax rate equal to 0%. As a result, the deputies of representative bodies of the local government, maximally trying to "protect" the interests of taxpayers by reducing the rates, are decreasing the filling of the revenue part of local budgets. It does not have a good impact on municipal development, because it significantly complicates the financing of the socio-cultural sphere, housing and public utilities, road maintenance and construction and other expenses, which according to the article 16 of the Federal Law No. 131 should be carried out by local government bodies. In such situation it is difficult to maintain the balance between the interests of taxpayers and the local budget, so applying the instrument of fixing both maximum and minimum limit rates of the land tax should be based on a balanced,

economically justified approach recorded in the highest tax document of the country. The establishment of zero rates should comply with the principles of social and economic efficiency.

Regarding the local personal property tax, it is appropriate to fix in the Federal Law No. 122-FZ the limiting deadlines, during which the newly constructed buildings, objects and other structures should be registered. This problem is especially relevant in the case when an extension to the building appears or the new building has been built at the location of the old one, that is, there has been an increase in the object's cost and, consequently, the tax basis, but the owner is not in a hurry to record it. Simplifying the process and reducing the cost of registration procedures for the execution of documents, establishing the mechanism of bringing individuals to responsibility for avoiding the registration of property rights in real estate units are quite implementable in the Russian legal and regulatory framework as the important measures of increasing the potential of personal property tax.

In the context of increasing the level of collecting local taxes many researchers note the real prospects for the development of property taxation in the Russian Federation. Due to the mentioned above, abolishing the share of the corporate property tax entering the local budgets is considered as a premature and unjustified measure. Meanwhile, such factors as stability of its returns, low mobility of the tax basis and economic efficiency count in favor of attributing this tax. Whereas the organizations use the local infrastructure (in particular roads and utilities), it would be logical to assign the taxes incoming from their property to local budgets. According to the preliminary evaluation, transferring 25% of revenues from the corporate property tax to the local level would increase tax revenues of local budgets by 35%.

The scientific community has repeatedly made proposals of attributing all property taxes to the local status, because it is appropriate to assign all those taxes and charges to local budgets, as the formation of their tax basis can be influenced by municipal authorities and they can be effectively managed by them.

Instruments regarding small business taxation

Small enterprises and individual entrepreneurs, as the main tenants of municipal property and land plots as well as the payers of special tax regimes, credited to local budgets according to standards, add 7% on average to the volume of their own revenues. Due to the different standards of allocations from special tax regimes, the contribution of small business to the local budget system is differentiated by the types of municipal units: urban districts contribute about 7% of their own income, municipal districts – 13% (*Table 8*).

Table 8. Contribution of small enterprises to local budgets of the Russian Federation, % from own revenues of budgets

Year	The share of revenues from small enterprises in own revenues of budgets		
	municipal units	urban districts	municipal districts
2006	5.3	5.7	8.9
2009	4.7	5.0	7.0
2012	6.4	6.9	9.0
2014	6.8	6.2	10.4
2018	7.2	7.0	13.2
Calculated by: reports of the Federal Treasury and Rosstat.			

Financial instruments of local government bodies are limited to two key types of stimulating small business development, in relation to which further improvement is appropriate.

1) The budgetary subsidy for small enterprises.

According to the Federal Law No. 209-FZ "On the Development of Small and Medium Business in the Russian Federation", the support of business by local authorities can be conducted through providing subsidies, budgetary investments and municipal guarantees regarding the liabilities of business entities. However, not all Russian municipalities have financial resources for assisting small and medium business, so it is appropriate to consider the issue of comparing small business development indicators, including increasing the contribution to budgets, with the level of stable co-financing of expenses for supporting small business from higher budgets.

2) Minimizing the tax burden for small enterprises.

Let us subscribe to the opinion of [26–27] that the tax burden should not be destructive for business, meanwhile, municipal authorities should not neglect the interests of local budgets. In this regard, it is appropriate to monitor the impact regarding the decisions of local government bodies in terms of establishing the value of the ratio correcting the basic revenue position when collecting the unified tax on imputed income from entrepreneurs and organizations on the tax burden. The results of such monitoring will show the dynamics of the tax and the rating according to the level of the tax burden, which, therefore, will reveal the validity of correcting ratios regarding the unified tax on imputed income for their compliance with the economic situation of territories taking into account achieving the balance of interests between small business and local budgets.

Besides, establishing the certain elements of taxation when applying them to micro- and small enterprises[4] within the framework of the Tax Code should be included to the competence of local authorities. In particular, the issue of granting the right to determine the amount of potential annual income of the individual entrepreneur, as well as the list of types of business activities due to which using of patent taxation system is permitted, should be taken under consideration. In this regard municipal authorities will be able to take into account the peculiarities and specifics of maintaining business activities within the territory of their municipality more efficiently. Herewith, it is possible to provide the establishment of framework criteria for the amount of revenues at the federal level.

Strengthening the justification of applying the instruments of the budgetary reallocation

It is known that in modern domestic and foreign studies there are different views on the need of stimulating the development of certain types of municipal units, and, consequently, the priority of budgetary reallocation in their favor. Thus, a number of studies testify such a priority in favor of cities as the growth points. For example, the work of [28] shows the significant positive impact of agglomeration effects on macroeconomic indicators of the regions. M. Fujita, P. Krugman and F.J. Venables [29] claimed that the role of development and modernization centers belongs namely to cities, but to a various extent and with different quality of growth. However, as the practice shows, not all cities in modern market conditions are ready for competition regarding labor and economic resources, and therefore

[4] Micro-enterprises include organizations having annual revenues up to 60 mil. rubles and the number of employees no more than 15 people; small enterprises include organizations having annual revenues up to 400 mil. rubles and the number of employees from 16 to 100 people.

cannot increase neither human, nor economic or fiscal capacity [30]. As N.V. Zubarevich noted [31], the equalizing approach to the spatial development, implicating the need for cities to share with the periphery, prevents the implementation of the policy aimed at systemic support of modernizing the economy and human capital of Russian cities. On the other hand, the theory of agglomerations explains the restraining of the periphery's development due to the concentration of economic activity in the regional center, and the theory of cumulative expansion indicates the dual effect from developing central cities, in particular, the generation of development pulses. Moreover, due to strengthening the relevance of the spatial component of territorial development, in the scientific community and management environment the attention is being increasingly paid to the polar issues: preserving the unique character of small and medium cities, developing large cities and agglomerations, and inequality of "center-periphery".

In the study [32] it is justified that the processes of concentrating the economic activity along with interregional divergence shape a positive trend of Russia's spatial development. However, the current budget policy is aimed, on the contrary, at convergence of regional development indicators, which implies compatibility of characteristics regarding the key budgetary instruments (formalized methods of allocating subsidies, standards of tax payments, etc.) with this goal. We are concluding that one of the shortfalls in justifying the instruments of budgetary reallocation is the lack of regular accounting of dynamics regarding the co-development of the region's center and periphery.

Appealing to the scientific literature, we note that it contains a number of detailed and interesting studies concerning the differentiation, asymmetry and polarization of intraregional space [33–40] with regard to the diversity of approaches, dynamics analysis and the identified ways of measuring the level of inequality. Therewith, the existing tools in various scientific works (coefficient of variation, Gini index, Theil index, integral estimate, transfer matrix, Markov chains, existence of β- and σ-convergence, etc.) in most cases are used for socio-economic development indicators of urban and municipal districts, slightly concerning budgetary indicators as well. Moreover, compared to the listed tools, in regard to the impact of budgetary reallocation on the fiscal capacity of the region, it becomes significant to study precisely the relative length of the margin between the vectors of the level of fiscal capacity per capita of the center and the periphery. The modern methodology does not contain methodological tools for conducting such measurements. In addition, this methodological gap distorts the possibilities of developing the fiscal capacity of the region, in particular, directly influencing the budgetary reallocation and the possibilities of implementing the incentive function of the inter-budget transfers system.

Expanding the tools reflecting the validity of budget reallocation measures through the line "center-periphery", the so-called Centro-regional Budget Provision Differentiation Index has been elaborated in the study. Let us indicate that centroregional differentiation expresses the differences in volumes of own revenues per capita between the regional center and peripheral municipal units of the same region. The index is based on two economic indices: Herfindahl-Hirschman index (the index for evaluating the degree of the branch's monopolization, 1945) and Theil index (the index for measuring social inequality, 1967). The developed index ($ICRD_{BP}$) takes into

account absolute indicators per capita and growth rates in the level of fiscal capacity, which increases the accuracy of calculations, because the cities with the lowest indicators per capita can be characterized by higher growth rates. The calculation of $ICRD_{BP}$ is supposed to be carried out according to the formula:

$$ICRD_{BP} = \sqrt{\frac{\sum_i [(BP_{it}^{RC} - BP_{jit}^{P})^2 + (\frac{BP_{it}^{RC}}{BP_{i(t-1)}^{RC}} - \frac{BP_{jit}^{P}}{BP_{ji(t-1)}^{P}})^2]}{\sum_i [(BP_{jit}^{P})^2 + (\frac{BP_{jit}^{P}}{BP_{ji(t-1)}^{P}})^2]}},$$

where BP_{it}^{RC} – the level of fiscal capacity per capita of the regional center's population *i* of own revenues in the year *t*;

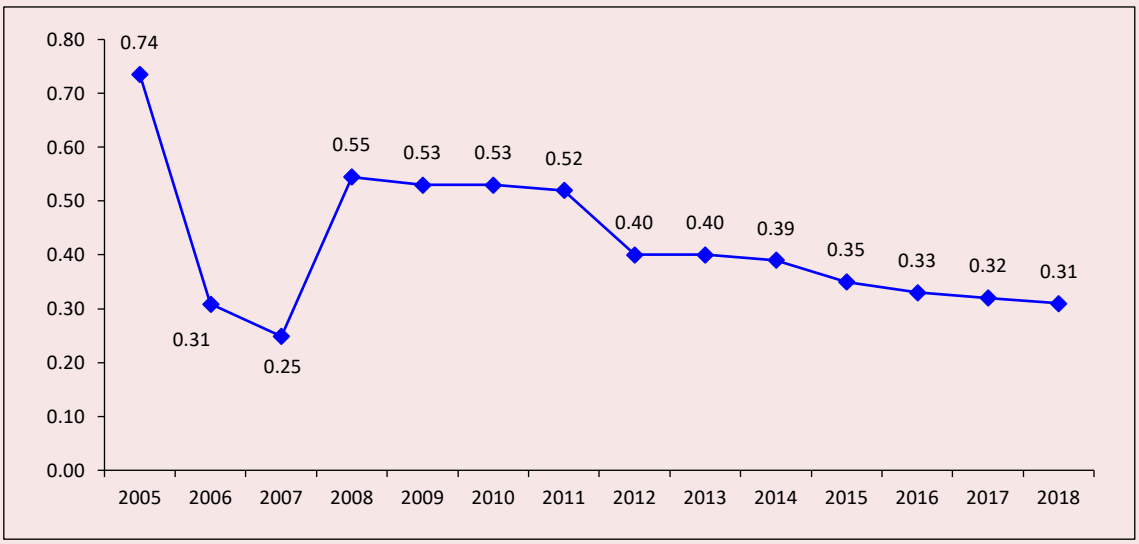
BP_{it}^{P} – the level of fiscal capacity per capita of the region's population *j* without the regional center *i* of own revenues in the year *t*;

$BP_{i(t-1)}^{RC}$ – the level of fiscal capacity per capita of the regional center's population *i* of own revenues in the year *t*–1;

$BP_{i(t-1)}^{P}$ – the level of fiscal capacity per capita of the region's population *j* without the regional center *i* of own revenues in the year *t*–1.

Interpreting the index values in time series means the strengthening of centroregional differentiation along with the index's growth and the weakening of centroregional differentiation under the index's decrease. The graphical interpretation of the index is a curve, whose approaching to the X-axis indicates a convergence process and equalization of fiscal capacity levels at the expense of stimulating its development. The monitoring of the index will allow authorities quantitatively to define the limits and dynamics of centroregional differentiation. It is assumed that the important step in justifying the use of budgetary reallocation instruments should be dividing the centroregional differentiation limits into intervals complying with certain strategic priorities. Moreover, conducting measurements over all Russian regions (due to the specifics, excluding Moscow, St. Petersburg, Sevastopol, the Leningrad and Moscow Oblasts, the Nenets Autonomous District) will allow carrying out their classification. This issue requires

Figure 3. The curve of centroregional differentiation index according to the level of fiscal capacity (using the example of the Vologda Oblast)



Source: compiled by the author.

additional research and calculations, so it will be the subject of our future studies.

Within the current stage of work, the elaborated methodological tools for measuring centroregional differentiation according to the level of fiscal capacity have been tested using the example of the Vologda Oblast as a typical region of the Russian Federation due to most indicators of socio-economic development. The Vologda Oblast, as noted above, in 2006 has moved to implementing the local government reform among the pilot regions. Calculating the index values has shown a remarkable trend to falling of its curve, which indicates the convergence in the levels of fiscal capacity of the regional center and periphery (*Fig. 3*).

The study of empirical data in the figure has shown the sharp fall in the curve of index in 2006, when among other pilot regions the Vologda Oblast started to implement the organizational and financial reform of the local government basics. The detailed assessments of this process, as well as its comparative calculations over other Russian regions will be carried out at the next stages of studies.

Conclusions. The results of the conducted study reveal that the modern public regional policy regarding the intraregional reallocation of budgetary resources in terms of developing the fiscal capacity of the entire region should correspond to the following key principles.

Firstly, it should correspond to the principle of reimbursement, which shows that the adoption of budgetary standards for some types of municipal units should not significantly reduce the fiscal capacity in others by applying appropriate compensation mechanisms.

Secondly, it should correspond to the principle of differential strengthening of the income basis, which takes into account the peculiarities, trends and historical traditions of the economy management regarding the different types of local territories. For example, in municipal units with the large property complex the main focus has to be established on stability of assigning property taxes (land tax, corporate property tax and personal property tax) to local government authorities. In municipal units with the weak production potential there is no economic sense to fill the budget with minimal volumes of income sources from enterprises, while it becomes important to stimulate the development of small business.

Thirdly, it should correspond to the principle of validity, which indicates the confirmation of certain budgetary reallocations by research and methodological tools.

The results of the presented study contribute to developing the theoretical aspects regarding the reallocation of budgetary resources in the region, which reflected in elaborating the research and methodological justification for applying the budgetary reallocation instruments, as well as in reasoning the principles of modern public policy in the field of the intraregional reallocation of budgetary resources, compliance with which will contribute to the development of the region's fiscal capacity. The practical significance of the study is due to the possibility of applying the identified positions in the activities of public authorities and local government bodies in solving the problems regarding the reallocation of budgetary resources in the region.

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Assessing Federal Transfers' Role in the Subnational Budget System of the Russian Federation*

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Abstract. Subfederal authorities' financial independence is an essential condition for their effective functioning. Currently, in Russia, the procedure of inter-budgetary regulation is excessively centralized, and the share of transfers in the structure of regional revenues is high. At the same time, subfederal budgets are the basic level of the budget system, which concentrates the main part of socially significant expenditures. In this regard, the development of a comprehensive tool for the empirical analysis of tax revenues and the effectiveness of inter-budget transfers, undertaken in the study, seems relevant. The purpose of the research is to develop an economic and statistical apparatus for assessing the results of transferring inter-budget transfers from the federal budget to the constituent entities of the Federation. Achieving this goal required to: consider the features of the structure of budget revenues in the regions; determine the scale of

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the territories' budget revenues heterogeneity, and give its quantitative assessment; identify the directions of the federal center's transfer policy; find out the nature of gratuitous transfers impact on the regional budgets. The novelty of the presented work is the creation of an economic and statistical apparatus for the study of the impact of federal budget policy on the region's public finance. This allowed us to characterize gratuitous transfers from the federal budget to the regions and determine whether there is a motivation to increase tax revenues in the Russian Federation's subjects or not. It is concluded that improving inter-budgetary relations should include measures to strengthen the Russian regions' tax potential, which is impossible if the stability of securing tax revenues is not ensured. Authorities need measures to prevent a direct correlation between actual and projected budget revenues and expenditures and the volume of transfers received from the federal budget to equalize budget security. The results of the research can be used to study the possibilities of improving budget policy in the direction of equalizing and stimulating the regions to strengthen their own revenue base.

Key words: transfers, income received, disposable income, heterogeneity, empirical analysis, regional budget, inter-budgetary relations.

Introduction

All states with a federal form of government use vertical inter-budget redistributions and transfers to lower-level budgets. There are two main reasons for the fact that the accumulated funds of the central government exceed their direct expenditures. First, the shift of income in favor of the central government is supported by the very principles of revenue and expenditure powers distribution between the levels of government, which are considered in the theory of public finance [1–4]. A multi-level system of budget services allows taking into account the characteristics of various types of public goods. Public services should be provided by the central government if 1) public goods of federal importance are more effectively provided centrally; 2) public services create positive effects and spread to other territories, in this case the lower level of government underestimates their effectiveness and provides less than socially optimal amounts; 3) the mobility of important production factors makes it possible for lower-level governments to export local problems or import the advantages of other territories; 4) there is a need to ensure universal equality in the provision of public services. There are three arguments in favor of decentralized public service delivery. The first is related to the population's heterogeneity and the difference in preferences regarding the number and ratio of benefits provided [5; 6]. The second argument is the proximity of local governments to the population, as a result, lower information barriers and a better understanding of the preferences and needs of the population of a particular territory [7]. The third argument is that it is possible to reduce the costs of political experimentation; individual territories are considered as laboratories for adapting new methods or approaches to state regulation [8].

The distribution of tax instruments of state regulation between the levels of government is based on the fact that the tax policy of lower-level governments can create external effects including three main categories: export of taxes, unhealthy tax competition for a mobile tax base, and excessive or insufficient taxation of activities that generate external effects. To prevent the taxes export, local taxes should be linked to the territory, i.e. the place of residence or production activity [9; 10]. Tax competition

between territories does not develop if the tax base of the lower level of government is not mobile [11; 12]. Finally, local taxes should not be applied to the areas where the costs are spatially localized, while the benefits extend beyond the territory, or, on the contrary, the costs are geographically distributed, and the benefits are concentrated in a single territory.

Thus, spatial diversity, reduced management and experimentation costs shift spending authority to the lower management level. At the same time, increasing mobility of factors and development results leads to an expansion of the sphere of external effects and increased spatial competition, which contributes to the reduction of the lower level tax powers and their increase in case of the central government. The resulting gap between the expenditure commitments and revenue sources is financed through a system of transfers, mandates, and grants from the central government.

The second main reason for vertical transfers is the budgetary inequality of the constituent entities of the Federation and the need to finance state-guaranteed budget goods and services. In federations, the problem of inter-regional differences due to the threat of separatism is more acute than in unitary states, the quality and quantity of budget services to the population cannot differ significantly by territory. But with comparable spending commitments, the regions have very different revenue potentials. These gaps are partially offset by the central government transfers. Russia's heterogeneity in all parameters of economic and social status is noted in many studies on the spatial aspects of the country's development. The need to reduce inter-regional differentiation, along with the examples of subfederal authorities' failed experiments at the beginning of market reforms, is the main argument used to justify the high centralization of public finances and large-scale inter-budgetary redistributions in the country.

The topic of policy in relation to subfederal budgets and horizontal transfers is constantly present in foreign and domestic scientific discussions. The issue of the validity of the revenue powers, expenditure obligations and transfers distribution has no formal solution, since it is influenced not only by economic, but also the political priorities [13]. Federal states differ significantly in the level of centralization of budget revenues and expenditures, as well as in the mechanisms and principles of transfer distribution [14–16]. Young federations, developing countries and transition economies demonstrate a relatively high level of budget revenues centralization and increased use of vertical transfers.

In the Russian literature, the discussion of various aspects of the problem of inter-budgetary redistributions has been going on since the beginning of political and economic reforms in the country. The issues of the theory of federal relations and their implementation in Russia has been considered [17–22]. Some of the proposals made by the authors have found application in the practice of horizontal financial relations, the principle of combining the levelling and stimulating functions of transfers to regions, the allocation of a target and non-target component in them is fixed in the Budget code of the Russian Federation. But the discussions focused on tax and spending powers of different levels [23–25], the distribution of obligations between the levels of government in the Russian Federation [26–28], types and sizes of inter-budget redistributions [29], legal and methodological problems of transfers allocation [30–34] continue. The reform of inter-budgetary relations is considered through the prism of efficiency [35–38], structural regional policy and

stimulating economic growth [39–40]. The impact of financial support mechanisms on management decisions and institutional reforms in the regions is analyzed [41]. However, publications rarely provide detailed empirical analysis of budget statistics as a justification. The present paper shows various methods for analyzing subfederal budget security and the contribution of transfers, demonstrating the dependence of the obtained conclusions on the methods of working with the sample at the same time.

We offer a detailed empirical analysis of the subfederal budgets' security before and after transfers from the Federal center, while evaluating the result of horizontal redistributions. The resulting conclusions may depend on the methods of analysis. The applied approach was used in the analysis of the municipal budgets [42]. The research was based on the reports on the execution of budgets of the constituent entities of the Russian Federation, presented on the website of the Treasury of Russia for the period of 2012–2018. The specified seven-year period is taken for analysis, since it is interesting to consider the dynamics of budget provision in the regions of the Russian Federation, to trace the changes related to the crisis and the sanctions imposed in 2014–2015.

The role of inter-budget transfers in the regional budget system

The main revenue items of subfederal budgets are tax revenues, non-tax revenues and gratuitous receipts, most of which are the transfers from the Federal budget. The level of independence of subfederal budgets can be characterized by the share of tax and non-tax revenues in the total budget income of the constituent entities of the Federation. They are commonly referred to as earned income. The distribution of the regions of the Russian Federation by the share of tax and non-tax revenues in the total revenues of their budgets is shown in *table 1*.

In most regions, the share of income received is in the range of 60-90%, with a modal range of 80–90%. As a positive change in the period under review, we can note, first, a reduction in the number of regions with a share of revenue received less than 60% of the total budget: in 2012, there were 23 regions, in 2018 there were 19. Secondly, the number of Federal subjects with a level of budget independence greater than 80% is increasing, from 29 in 2012 to 40 in 2016–2017, with a decrease (to 34) in 2018. Finally, there is a slight reduction in inter-regional differences, the range of variation in 2012–2016 was over 80%, and in 2018 the difference between the maximum and minimum values decreased to 77%.

Table 1. Distribution of the regions by the share of the incomes received

Interval of the incomes share, %	Number of the regions in groups						
	2012	2013	2014	2015	2016	2017	2018
10–20	2	2	3	2	1	2	0
20–30	4	2	4	2	3	1	3
30–40	1	4	2	5	3	6	8
40–50	6	5	4	2	4	3	2
50–60	10	10	11	10	7	5	6
60–70	13	9	11	14	12	16	16
70–80	18	19	17	14	15	12	16
80–90	26	29	28	26	29	29	23
90–100	3	3	5	10	11	11	11
Source: authors' calculations.							

Negative phenomena include the absence of Federal subjects whose budgets do not depend on gratuitous transfers, and the preservation of a large number of regions that do not have a stable revenue budget base of their own. As a result, any long-term plans for socio-economic development presented by the regional governments are not provided with guaranteed resources in a large part of the country.

In these conditions, the transfers from the Federal budget are an important resource for the subfederal finance. The regions' dependence on gratuitous transfers differs significantly. The distribution of the share of transfers in the total budget revenues of the Federal subjects is shown in *table 2*.

The share of gratuitous transfers from the Federal budget for most regions is in the range from 10 to 40%, the modal range for the entire period under review is 10-20%. It should be noted that every year there is an increase in the number of regions with a decreasing share of transfers in their budgets. If in 2012 the share of transfers in total budget revenues in thirty regions of the Federation was less than 20%, in 2017 the number of such regions was 42 already.

But there are territories where budget revenues from the Federal center play a significant role. Thus, in 2014, the share of transfers from the Federal center in 13 regions was more than 50%, while in the remaining years of the period under review, there were 11 such regions.

The situation when central government transfers play a crucial role in the budget of the Federal subjects cannot be called normal for a state declaring the principle of budget federalism. This indicates an overestimated centralization degree of financial resources in Russia. They try to justify this situation by solving important national and geopolitical problems that require the concentration of resources. The arguments about the need to smooth out significant inter-regional differences in order to preserve the state's unity are made. However, even taking into account the really large internal heterogeneity of the country, it is difficult to find an explanation for the fact that all the constituent entities of the Russian Federation receive support from the Federal center, while the formation of the Federal budget is carried out at the expense of the same regions' economic activities.

Estimation methods of the results of the Federal center's transfer policy in the Russian Federation

The concentration of financial resources in the center and large-scale horizontal transfers are explained by the need to equalize the budget security and socio-economic development

Table 2. Distribution of the regions by the share of gratuitous transfers from the Federal budget

Interval of the transfers share, %	Number of the regions in groups						
	2012	2013	2014	2015	2016	2017	2018
0–10	5	6	7	11	14	13	11
10–20	25	26	26	25	29	29	23
20–30	18	20	18	17	14	13	18
30–40	15	8	12	12	13	13	15
40–50	9	12	9	9	4	6	6
50–60	5	4	4	2	4	3	3
60–70	2	2	2	5	4	5	6
70–80	3	3	4	2	2	1	2
80–90	2	2	3	2	1	2	1

Source: authors' calculations.

of the constituent entities of the Russian Federation. In order to assess the degree of this goal implementation, it is interesting to compare the characteristics of dispersion and heterogeneity before and after the receipt of gratuitous transfers from the Federal budget.

A number of statistical characteristics are used to identify the scale of heterogeneity, including the extent of asymmetry, standard deviation, and coefficient of variation. The properties of these indicators differ, so to confirm the stability of conclusions several indicators are used.

The extent of the asymmetry (W) evaluates the inequality in terms of the ratio of the maximum to the minimum value of the indicator, i.e.

$$W = \frac{x_{max}}{x_{min}}. \quad (1)$$

The standard deviation (M) is one of the most popular characteristics of the variation. it is calculated using the formula:

$$M = \sqrt{\sum_{i=1}^{N}(X_i - \bar{X})^2}, \quad (2)$$

where X_i – value of the indicator of the i-th region,

$\bar{X}$ – average value of the indicator for all regions.

The value of the standard deviation depends on absolute levels of the indicators, and the switching to other units of measurement or to a different level of values (for example, as a result of inflation) affects quantitative estimates of heterogeneity. The coefficient of variation (V) is calculated by dividing the standard deviation by the average value, and the result is multiplied by 100%. It allows to compare heterogeneity in samples with different metrics and scales of indicators:

$$V = \frac{M}{X_a} \cdot 100\%. \quad (3)$$

The indicators of variation should decrease with the increase of homogeneity in the sample.

The indicators of variation provide an aggregated estimate of the degree of heterogeneity. To answer the question which groups of regions were recipients of gratuitous transfers, it is necessary to compare the distribution of the regions' budget revenues before and after receiving transfers from the Federal budget. If transfers are received by the majority of Russian regions, then it makes sense to calculate a similar distribution of centered values of the received and available budget revenues. It is advisable to use Lorentz curves to visualize changes (increase or decrease) in the interterritorial differentiation by the indicators under consideration.

A quantitative assessment of the differentiation level by income is given by the Gini index and the coefficient of funds. The Gini index measures the area between the line of absolute equality and the Lorentz curve and characterizes the distribution of income across all groups of regions. It shows the direction of the mechanism for distributing Federal financial assistance: either the distribution of budget revenues is somewhat uniform among the constituent entities of the Russian Federation, or a small number of regions receive more transfers from the Federal budget. The higher the Gini index value, the greater the differentiation between regions. The coefficient of funds is used to study the inequality between polar groups of regions. It is calculated by the ratio of total revenues received by 10% of the Federal subjects with the highest budget revenues to the revenues of 10% of the regions with the lowest budget revenues.

In order to understand how the current system of inter-budgetary relations is justified and effective, the methods of correlation and regression analysis are also used. It is obvious

that a normal system of inter-budgetary regulation should not allow abrupt changes in the territories' comparative positions, and such a policy cannot arouse support in society. The Spearman or Kendall rank correlation coefficients are calculated to test the reasonableness of the size and flow of inter-budget redistributions. The regions are ranked first by the level of income received, then by the level of disposable budget income, and then the correlation of the obtained series of ranks is estimated. If the ordered positions of the regions remain unchanged, the correlation coefficient between the ranks in terms of income received and the ranks in terms of disposable income should be equal to 1.

To calculate **Spearman's rank correlation coefficient**, each value of the two studied data series is assigned a rank, then the rank differences d are determined. The Spearman coefficient is calculated as follows:

$$\rho = 1 - \frac{6\sum d^2}{n(n^2 - 1)}, \qquad (4)$$

where $\sum d^2$ is the value of the sum of squares of rank differences,

n is number of paired observations.

The Kendall rank correlation coefficient is recommended when there are outlying observations. The values of the first indicator (X) are sorted in ascending order, then each value is assigned a certain rank. Then the values of the second indicator (Y) are ordered and numbered in the same way. As a result, the correlation coefficient is calculated as follows:

$$\tau = \frac{2S}{n(n - 1)}, \qquad (5)$$

where $S = P - Q$, P is the total number of observations that are behind the current observations with a higher rank value Y;

Q is the total number of observations that are behind the current observations with a lower Y rank.

The role of the goals of smoothing interregional differentiation by budget security in transfer policy can be estimated by means of regression analysis. To verify this statement, it is interesting to assess the dependence of the average per capita gratuitous transfers sent to the regional budgets from the Federal budget on the tax and non-tax revenues of the budgets of the subjects of the Federation per capita. If the policy of Federal transfers distribution is aimed at equalizing the regional budget revenues per capita, then there must be a statistically significant negative relationship. If the transfers do not depend on the current value of the regional budget revenues per capita, the relationship will be statistically insignificant. If the relatively well-off regions receive the transfers, the link should be positive. In this aspect, it is proposed to evaluate the following equation:

$$ln\, T_i = \alpha + \beta \cdot ln\, R_i + \varepsilon_i, \qquad (6)$$

where T_i is the transfers from the Federal budget to the i^{th} subject of the Federation per capita, adjusted for the coefficient of regional price increases[1];

R_i is the amount of tax and non-tax income per capita of the i^{th} subject of the Federation, adjusted for the coefficient of regional price increases.

The issue of the disincentive effect of large-scale interregional redistributions has been repeatedly raised in the literature. It was suggested that significant Federal intervention creates dependency attitudes in recipient regions, while donor regions are less motivated to develop the territory's tax base. The presence and direction of incentives for the development of the region's economic potential can be estimated by the marginal effect of increasing

[1] The average regional wages coefficient in the regions of the Far North and equivalent localities established by the Government of the Russian Federation was used as a coefficient of regional price increases.

the revenues of the subject of the Federation. Moreover, it makes sense to be limited to considering only tax revenues to the regional budgets, since they reflect economic activity in a greater degree. Thus, it is interesting to assess the dependence of changes in disposable income including transfers on changes in tax revenues to the regional budget:

$$(Y_{it} - Y_{it-1}) = \gamma + \lambda\,(X_{it} - X_{it-1}) + \varepsilon_{it}, \quad (7)$$

where Y_{it} is the disposable income of the i^{th} Federal subject in year t;

X_{it} is tax income of the i^{th} Federal subject in year t[2].

Assessment of changes characterizes the work of the institutional mechanism and the incentives being formed. If changes in budget revenues are mainly determined by transfers, tax revenues are not a significant factor in the regional policy, and the incentives to develop economic activity in the territory are not formed. Thus, in the absence of the above incentives, the angular coefficient – in the regression equation should be insignificant. The statistical significance and positivity of this coefficient will indicate that the regions of the Russian Federation do not lose incentives to develop the economic potential of the territory and, as a result, to increase the tax revenues accumulated on the territory of the region.

The regression equation estimated marginal effect of not all taxes payable to the budgets of constituent entities of the Federation, only the basic ones such as tax on profit of organizations, tax on individual income and property taxes were taken into account. On average, these tax revenues provide about 80% of total revenues to the regional budgets from all types of taxes.

Efficiency of inter-budget transfers is a complex concept. This includes, first, the focus of transfers on equalizing the budget security of the Russian Federation's subjects. Second, the transfer policy should not deprive the regions of the incentives to increase their own tax potential. And, third, the system of inter-budgetary regulation should not allow abrupt changes in the comparative positions of territories before and after transfers.

Assessment of achievement the goals for reducing interregional differences

To study the success of inter-budget redistributions from the point of view of equalizing the regions' budget security, we compared the indicators of variation for the received and disposable incomes of the subjects of the Russian Federation per capita, i.e. for the regions' budget revenues before and after receiving transfers (*Table 3*).

Table 3. Indicators of heterogeneity in the level of budget income per capita

Indicator	*Received income*						
	2012	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*
Asymmetry scope	45.3	44.3	48.1	56.4	40.0	47.5	47.9
Standard deviation	46.5	48.7	57.1	73.5	62.3	66.1	76.5
Coefficient of variation, %	104.6	105.4	113.8	131.3	108.3	108.6	110.0
	Disposable income						
	2012	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*
Asymmetry scope	13.3	13.1	14.8	18.7	20.5	18.1	18.8
Standard deviation	59.1	62.6	75.2	75.6	87.0	89.1	106.8
Coefficient of variation, %	93.2	95.4	104.5	116.6	110.9	106.6	109.1
Source: authors' calculations.							

[2] The transition to the logarithms of variables and to the interpretation of coefficients in terms of elasticity was impossible due to the fact that there are negative values of variables.

From the above data, it can be seen that the asymmetry scope between the subjects of the Russian Federation after the transfer of funds from the Federal budget is reduced 2–3.4 times. The most significant reduction in the scope of asymmetry was observed in 2012–2014. Consequently, thanks to the transfers, the gaps between the poorest and wealthiest regions are significantly reduced.

The standard deviation of the regions' budget provision by the disposable income exceeds the same indicator for the received income. However, this is largely due to the growth of absolute budget revenues due to the transfers. The most significant increase in the standard deviation occurred in 2016 and 2018 (by 40%). The standard deviation increased the least in 2015 (by only 3%). The standard deviation increases as the values of all the sample elements increase.

The coefficient of variation partly solves the problem of the influence of different levels of values in the sample; it is calculated as the ratio of the standard deviation to the average value. This allows to exclude the impact of different absolute levels of budget revenue before and after transfers. Calculations show that in 2012–2015, 2017 and 2018 the heterogeneity of revenues of subfederal budgets in the Russian Federation after transfers from the Federal budget has decreased, as evidenced by the lower value of the coefficient of variation for the indicator of total (disposable) income compared to the value of this coefficient for the received (tax and non-tax) income. However, in 2016, the coefficient of variation in budget security increased after transfers to the regions, as a consequence, they didn't manage to achieve even relative alignment that year. We should also note a very slight decrease in the coefficient of variation in the last two years of the period under review.

To identify the groups of regions that were the main recipients of gratuitous transfers, it seems appropriate to compare the territories' budget revenues before and after receiving transfers from the Federal budget. The distribution of the subjects of the Russian Federation by the amount of tax and non-tax (received) income, as well as by the amount of total (disposable) income is shown in *table 4*.

Table 4. Distribution of the regions by the amount of the received and disposable income

Per capita income, thousand rubles	Number of the regions included in the group													
	2012		2013		2014		2015		2016		2017		2018	
	RI	DI	RI	DI	RI	DI	RI	DI	RI	DI	RI	DI	RI	DI
0–10	3	0	3	0	3	0	3	0	1	0	1	0	0	0
10–20	9	0	7	0	6	0	7	0	7	0	4	0	5	0
20–30	29	2	23	1	24	0	18	0	15	0	14	0	9	0
30–40	18	32	22	27	22	22	24	16	21	10	19	4	16	1
40–50	8	19	12	28	12	27	13	28	18	27	20	26	16	10
50–60	4	11	3	6	3	11	4	17	5	19	9	20	13	28
60–70	3	7	3	4	4	9	3	7	3	8	3	10	7	12
70–80	0	2	1	4	2	4	2	5	3	7	2	6	3	6
80–90	1	0	2	2	0	1	2	2	2	2	1	5	3	8
90–100	1	0	1	2	0	1	1	0	2	3	3	3	1	6
100–150	4	4	2	2	5	2	3	2	3	1	3	3	4	4
150–200	0	3	1	4	0	4	1	3	1	1	2	1	4	3
More than 200	3	3	3	3	4	4	4	5	4	7	4	7	4	7

RI – received income; DI – disposable income.
Source: authors' calculations.

The table shows that gratuitous receipts from the Federal budget significantly increase the budget security of low-income subjects of the Russian Federation. Thus, after transfers in 2012 and 2013, the number of the regions with per capita budget revenues less than 30 thousand rubles decreased significantly, and in 2014–2018 there were none of them. Before the receipt of funds from the Federal budget to the subjects of the Federation, the modal interval for per capita income was from 20 to 30 thousand rubles in 2012–2014, from 30 to 40 thousand rubles in 2015–2016, and from 40 to 50 thousand rubles in 2017 and 2018. After transfers from the Federal budget to the regions, the modal interval for 2012 was from 30 to 40 thousand rubles, in 2013–2017 from 40 to 50 thousand rubles, in 2018 from 50 to 60 thousand rubles. In 2017, the modal interval did not change after the receipt of gratuitous transfers to the regional budgets, but the number of regions where the disposable income per capita exceeded 50 thousand rubles significantly increased.

In general, during the period under review, for most regions, per capita income was in the range of 20–50 thousand rubles before the gratuitous transfers, and in the range of 30–70 thousand rubles after receiving the transfers to the regional budgets. Thus, we can talk about a significant increase in the absolute and relative amount of funds in the regional revenues received as a result of budget regulation.

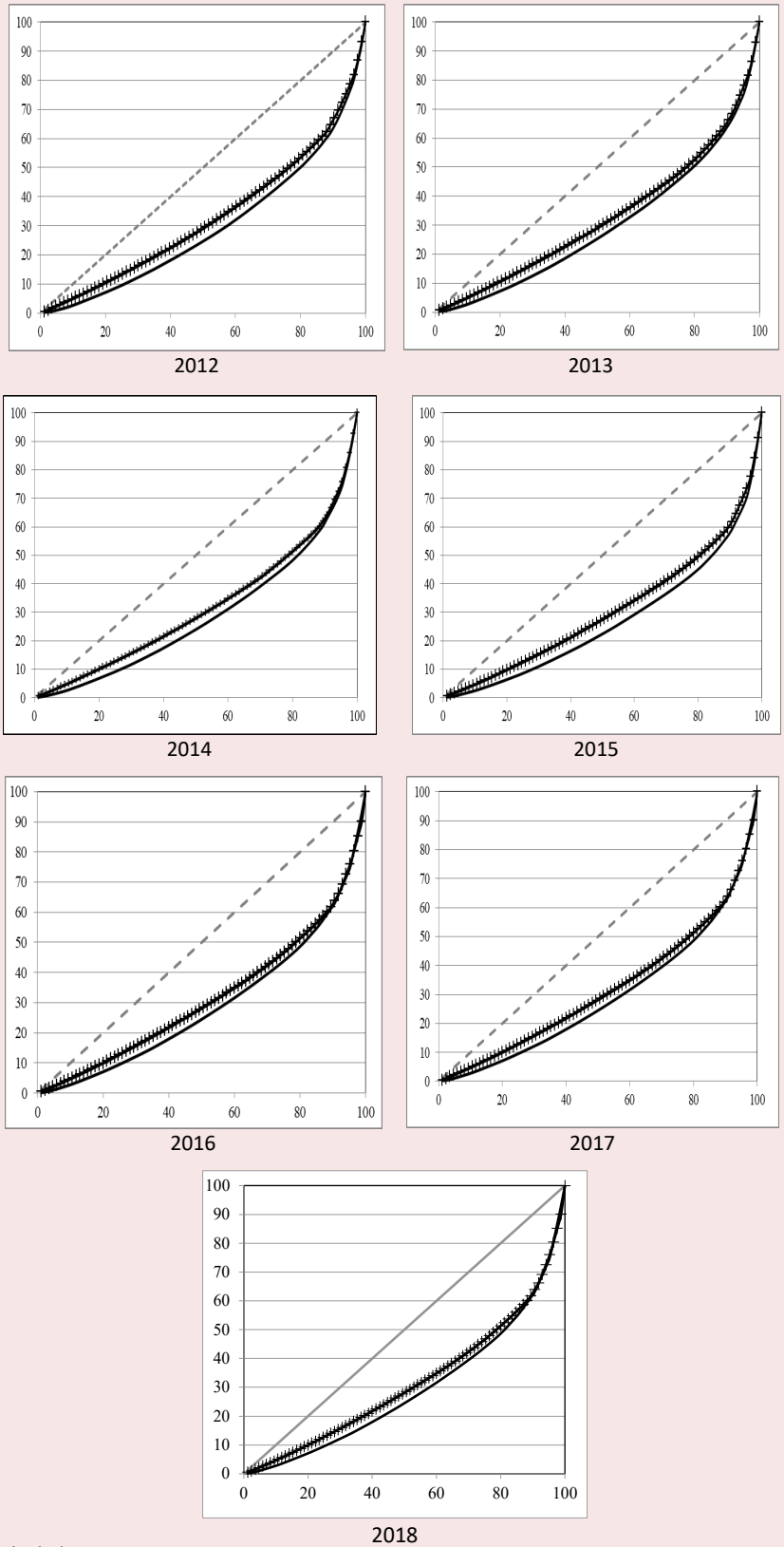
In order to exclude the impact of an increase in the average value of the regional budgets' revenues after transfers from the Federal budget, it is useful to assess the distribution of tax and non-tax (received) revenues and total (disposable) revenues of the budgets of the subjects of the Russian Federation, normalized relative to their average level (RIN and DIN) (*Table 5*).

Table 5. Distribution of the regions by the value of indicators of the received and disposable income normalized relative to the average value

Per capita income, thousand rubles	Number of the regions included in the group													
	2012		2013		2014		2015		2016		2017		2018	
	RIN	DIN	RIN	DIN	RIN	DIN	RIN	DIN	RIN	DIN	RIN	DIN	RIN	DIN
Less than -30	7	10	7	9	9	29	21	31	18	33	22	37	30	49
-30 – -20	17	28	18	37	24	25	22	28	22	21	18	18	16	8
-20 – -10	24	21	27	16	22	6	20	6	20	9	18	7	13	5
-10 – 0	17	6	13	3	12	9	6	6	7	7	9	7	7	9
0–10	5	6	4	4	3	4	2	2	2	3	3	2	3	0
10–20	2	2	4	3	4	1	2	2	4	3	2	3	3	3
20–30	2	0	1	2	2	1	3	1	2	0	2	2	1	1
30–40	0	0	2	0	0	0	0	0	2	0	2	0	3	0
40–50	1	0	0	0	0	1	1	0	0	0	1	0	0	0
50–60	1	0	1	2	3	1	0	0	0	0	0	1	0	1
60–70	4	3	0	0	0	0	1	1	0	0	0	0	0	0
70–80	1	0	2	0	1	0	2	0	1	2	1	0	1	0
80–90	1	1	0	0	0	1	0	0	2	0	1	1	0	0
90–100	1	1	0	1	1	0	0	1	0	0	1	0	0	2
100–150	0	2	1	3	0	3	1	3	1	2	1	1	4	0
150–200	2	1	1	1	2	0	1	1	0	1	1	3	0	3
More than 200	1	2	2	2	2	4	3	3	4	4	3	3	4	4

RIN – received income normalized relative to the average value; DIN - disposable income normalized relative to the average value.
Source: authors ' calculations.

Lorentz curves for interregional distribution of budget revenues per capita before (-) and after gratuitous transfers (+).



Source: authors' calculations.

Taking into account the fact that transfers from the Federal budget are sent to almost all constituent entities of the Federation, which leads to an increase in the regions' budget security, the results of transfers from the center seem less appropriate. As follows from the data in the table, both the number of regions with incomes significantly higher than the average value and the number of regions with the lowest budget incomes increases during the entire period under review. Special attention should be paid to the distribution of the disposable income values normalized relative to the average level, i.e., the income of the subjects of the Federation after the transfer of funds from the Federal budget. The group of the regions with a normalized disposable income from 20 to 70 thousand rubles per capita was the smallest, compared to the high-income and low-income groups.

Changes in the distribution of budget revenues as a result of horizontal transfers can be shown using Lorentz curves, comparing the graphs of the received and disposable budget revenues (*Figure*). The pre-transfer budget revenue distribution curve is further from the absolute equality line than the post-transfer revenue distribution curve. Consequently, interregional differentiation was decreasing throughout the years of the period under review as a result of gratuitous transfers. However, if we take into account the scale of inter-budgetary redistributions in the country, the achieved differentiation decrease can be estimated as very modest.

To quantify the level of differentiation by the regional budget revenues, the Gini index and the coefficient of funds were calculated. The values of these indicators are calculated for tax and non-tax (received) and total (disposable) revenues of the budgets of the constituent entities of the Russian Federation (*Table 6*).

Both coefficients decrease after the distribution of transfers indicating the inter-regional differences' reducing. However, the equalizing effect decreased over the period on the whole, and the difference between the coefficient values for the received and disposable income decreased significantly. The emphasis on smoothing differentiation was strengthened in 2015, then there was its significant reduction.

Evaluating the objectivity and effectiveness of transfer policy

The results of calculating the Spearman and Kendall rank correlation coefficients

Table 6. The coefficient of funds and Gini index for budget revenues of the constituent entities of the Russian Federation

Year	Coefficient of funds			Gini index		
	Received income	Disposable income	Difference	Received income	Disposable income	Difference
2012	14.37	6.99	7.38	40.85	34.31	6.54
2013	13.73	7.11	6.62	40.23	34.74	5.49
2014	14.38	7.55	6.83	42.70	36.88	5.82
2015	16.12	8.31	7.81	45.98	38.53	7.45
2016	12.90	7.68	5.22	41.75	36.81	4.94
2017	12.74	7.56	5.18	41.34	36.64	4.70
2018	13.31	7.90	5.41	42.31	37.78	4.53

Source: authors ' calculations.

Table 7. Spearman and Kendall rank correlation coefficients for the series of received and disposable per capita incomes of the regional budgets

Indicator	2012	2013	2014	2015	2016	2017	2018
Spearman rank correlation coefficient	0.74	0.77	0.71	0.75	0.77	0.79	0.79
Kendall rank correlation coefficient	0.61	0.64	0.62	0.63	0.66	0.67	0.67
Source: authors ' calculations.							

for tax and non-tax (received) and total (disposable) revenues of regional budgets per capita are presented in *table 7*. After the regions receive gratuitous transfers, their relative positions (ranks) often change. The correlation coefficients of ranks are rather far from unity, although the positive correlation of ranks was dominant, the regions possessing higher disposable incomes had higher levels of budget revenues received.

To answer the question, if the funds transferred from the Federal budget to the constituent entities of the Russian Federation serve the purposes of balancing their budget sufficiency, ley us estimate the dependence of per capita gratuitous transfers allocated to the regional budgets from the Federal one, from tax and non-tax revenues of the regional budgets per capita.

It should be noted that taking into account the impact of regional rise in price is very important, as it radically changes the regression estimates and conclusions. Without adjusting for higher costs for the individual territories' sustainment, the angular coefficient (β) turns out to be positive and statistically significant for all years, which leads to the conclusion that more affluent regions receive the funds. The positive correlation of unadjusted values is explained by the fact that the Northern and Eastern regions have higher absolute levels of budget security and are the recipients of large volumes of transfers. This fact largely reflects the high cost of providing budget services and the high unit costs of creating and maintaining social infrastructure in the North and East of the country. The regression estimates results for the adjusted data are shown in *table 8*.

Estimates of the equation indicate that there is a statistically significant negative relationship between the transfers and the revenues received by the regional budgets. Gratuitous transfers depend on budget security, and there is a tendency to send them to the regions of the Federation with the lowest per capita income received. What stands out however is the low coefficient of determination, the highest value of which reaches 0.19. This suggests that the factors that are not related to the smoothing of the interregional differences in the budget services and functions play a more significant role in the transfer policy.

Table 8. Estimation of the gratuitous transfers' dependence on the revenues received by the constituent entities of the Federation

Coefficient	2012	2013	2014	2015	2016	2017	2018
A	3.596 (0.419)	3.822 (0.472)	3.870 (0.444)	4.049 (0.399)	4.076 (0.494)	4.576 (0.496)	4.284 (0.476)
B	-0.349 (0.123)	-0.424 (0.136)	-0.417 (0.126)	-0.468 (0.112)	-0.470 (0.135)	-0.579 (0.133)	-0.420 (0.124)
R^2	*0.09*	*0.11*	*0.12*	*0.17*	*0.13*	*0.19*	*0.12*
Source: authors' calculations. Standard coefficient errors are shown in parentheses.							

Table 9. Estimation of the disposable income changes dependence on the changes in tax revenues of the constituent entities of the Federation

Coefficient	2013	2014	2015	2016	2017	2018
Γ	-1543 (799)	-2541 (550)	-3317 (610)	-184 (542)	1522 (595)	3605 (653)
Λ	1,043 (0,159)	1,102 (0,063)	1,218 (0,089)	1,016 (0,051)	0,959 (0,062)	1,028 (0,059)
R^2	0,35	0,79	0,70	0,83	0,75	0,79
Source: own calculations. Standard errors of coefficients are given in brackets.						

Let us consider the marginal effect of increasing tax revenues received by the budgets of the Russian Federation's constituent entities in order to identify the regions' incentives to increase tax revenues accumulated in the respective territories. Since budget revenues have monetary measures, it is necessary to exclude the impact of price changes, otherwise the regression results will reflect the correlation of trends and price indices, rather than the variables being studied. Regional consumer price indices were used to make the data comparable. The obtained estimates[3] (*Table 9*) confirm the hypothesis that incentives for the development of the region's tax base remain, despite large-scale interregional redistributions. The dependence of changes in the total budget revenues on the region's tax revenues appeared to be positive and statistically significant at a 99% confidence level for all the considered periods. Moreover, the coefficient of regression determination is quite high, and the tax potential of the regions of the Russian Federation plays a decisive role in shaping the territory's public finances.

[3] Analysis of the observation cloud revealed a number of outliers, they were related to Moscow for the entire period of observations, to the Tyumen Oblast in 2013 and 2018, to the Sakhalin Oblast and the Republic of Crimea in 2015, to the Khanty-Mansi Autonomous Okrug in 2018. These observations were excluded from the sample.

Conclusion

The existing system of public administration in the Russian Federation is characterized by unequal relations between the center and the regions, and there is a strict dominance of the power vertical. One of the elements of high centralization is the concentration of financial resources and intense transfer activity.

The paper proposes an approach that uses statistical and econometric tools to study the impact of the Federal budget policy on public finance at the subfederal level. Based on it, the authors characterize the direction of gratuitous transfers and test the preservation of motivation in the regions of the Russian Federation to increase revenue collection in the territories.

The conducted empirical analysis of the results of the budget subfederal policy has shown that large-scale vertical redistributions lead to a certain reduction in the budget security differentiation, but the resulting effect does not correspond to the amount of the involved resources. Dynamics estimates confirm that the subfederal budget policy has not solved the problem of significant interregional inequality in Russia, the differences remain quite considerable and there is no tendency to reduce them. Financial resources are returned to the regions through the transfers with a contribution from negotiations with the Federal center.

The structure of regional budget revenue sources varies greatly; there is a large number

of Federal subjects whose revenue base is unstable and depends on the transfers from the Federal center. This makes it difficult for the regional authorities to develop long-term development programs, since the budget resources for their implementation are undefined. As a result, the distribution of transfers serves not so much to equalize the regions' budget security, but to a large extent is used to return the financial resources to constituent entities of the Federation, which is influenced by negotiations with the Federal authorities and the priorities of the Central government.

Despite the active inter-budget redistributions, the Federal subjects still have incentives to expand the tax base of their territories. However, the acceleration of economic growth and development on a new technological basis require creating conditions for the active generation of innovations and their rapid spread. Excessive centralization of public administration, narrow powers of regional authorities and, as a result, the lack of a basis for competition in institutional design between the subfederal governments hinder the development of the initiative. The regional finances' large dependence on the Federal center limits the horizons of the territory's long-term plans, calling into question their resource endowment and feasibility.

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MODELING AND FORECAST OF SOCIO-ECONOMIC PROCESSES

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Models of Forest Management Institutional Environment Formation at the Regional Level of the Russian Federation*

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Abstract. The experience of effective forest management in the most developed forest countries proves the important role of the institutional environment in this process. Taking into account the territorial specifics is a necessary condition for its formation. In the Russian Federation, there has been a long-standing controversy about the ineffectiveness of the institutional environment existing in forest management. First of all, this applies to the institution of forest plots lease defined in the Forest code. As a rule, the discussions are based on the general indicators of forest development reducing the objectivity of individual elements evaluation. In this regard, one of the most important tasks at the moment is creating a methodology and tools allowing to obtain the estimates related to the development of individual elements of the forest management institutional environment, in particular, the elements of the forest lease system. The main purpose of the research is to develop the general approaches in order to analyze the dynamics of the environment elements formation associated with the lease of forest plots in the region of the Russian Federation and obtain the appropriate models on this basis. To achieve this goal, the system of forest lease in the Vologda region was studied and the models for the development of its main elements were formed. The methods of system approach, analysis and synthesis, generalization and comparison, classification and systematization, mathematical statistics were used. The scientific novelty of the research involves developing approaches to creating the models describing the dynamics of the forest lease system elements development in the Russian Federation using linear approximation of time series of their parameters. The theoretical significance lies in the development of a methodology for studying the dynamics of the institutional environment formation associated with the system of forest lease in the region of the Russian Federation. In practical terms, the research findings will allow to determine the main trends in the development of the forest lease system at a higher quality level for further comprehensive analysis, as well as to make short- and medium-term forecasts.

Key words: forest complex, institutional environment, modeling, forest plots lease.

1. Introduction

More than 20% of the world's forests are located on the territory of the Russian Federation, which is much more than in the leading timber-producing countries of the world: the USA, Canada, China, Sweden, and Finland. At the same time, the Russian Federation's share in the global timber market is only about 3%. The industry's contribution to the country's GDP is estimated at just over 1%[1]. This is partly caused by the fact that most of the Russian forests are not suitable for intensive sustainable forest management due to low productivity [1]. The main reasons for this situation also include high dependence on foreign economic conditions; high degree of equipment physical deterioration; low level of wood raw materials processing causing lower productivity and high waste volume; lagging in the development of advanced technological orders; insufficient provision with highly qualified personnel; gaps in the legal framework; high level of illegal wood trafficking; depletion of the resource base in the most accessible areas; underdeveloped forest infrastructure; imperfect and permanently changing institutional environment; rather low investment attractiveness of the industry in general [2]. Many authors have come to the conclusion that the main problems of the forest sector are related to the inconsistency of the

[1] Prospects of the forest complex in the modern economy: innovative development. *ProDerevo*. Available at: https://proderevo.net/analytics/main-analytics/perspektivy-lesnogo-kompleksa-v-sovremennoj-ekonomike-innovatsionnoe-razvitie.html (accessed: 19.12.2019).

institutional environment with the peculiarities of market regulation in Russia [3; 4; 5].

The basis of forest management in the conditions of state ownership of the forest Fund is the distribution of rights and responsibilities between the state and private timber business [6; 7]. The state's withdrawal from performing its production functions of forest management is associated with the development of long-term use on the basis of concession agreements and lease agreements. The formation of a rational forest policy aimed at improving the efficiency of the Russian forest sector involves the creation of appropriate institutional forms. The choice of the most optimal configuration of the institutional environment is complicated by the territories' diversity in the Russian Federation, as well as by the transition to an intensive model of forest management. Currently, there is a broad discussion on the necessity to make changes to the Forest code. There are constant changes in legislation in the field of forest management relations. This indicates an unsettled system of institutional relations. In the context of the tasks to be solved, it is extremely important to assess the effectiveness of the existing institutions, determine their compliance with modern realities and develop the main directions for changing the institutional environment, taking into account the current world practice and its thoughtful adaptation to the Russian conditions [3; 8]. All this ultimately requires creating adequate models that allow such work to be carried out effectively and comprehensively. The quality of models primarily depends on the adequacy of the micro-level process display. However, to date there is no formal description of them that could be used for creating simulation models. In the Russian Federation, this situation is fully typical of the forest lease system which is formed mainly at the regional level. In this regard, we set a new research task to study and develop adequate models for the development of the institutional environment elements associated with the forest plots lease at the regional level of the Russian Federation.

The main objectives of the study are to assess the prospects for the development of the existing forest management institutional environment in the Russian Federation and to develop the approaches to analyze the dynamics of the environment elements formation including the forest plots lease in the region of the Russian Federation to obtain the appropriate models on this basis.

2. International experience of forest management

The formation of the forest complex institutional environment at the state level is a multi-faceted task requiring to take into account the characteristics of forest resources and their formation conditions, the existing administrative structure, the adopted state strategy of forest industry development, the social structure, the mentality of the population and other factors. The main criterion is to find the optimal balance between the development of economic functions and the preservation of ecological and social functions of forests.

Federal state structure requires the redistribution of areas of responsibility between the center and the territories. There are various options, but the following two approaches are generally pointed out: the distribution of state forest land by type of ownership (Federal forests under the jurisdiction of the Federal center, regional forests under the jurisdiction of regional state authorities); the distribution of functions of state management of forests and the forest sector vertically and horizontally, that is, with the participation of Federal, regional and municipal authorities. The countries that have implemented the first approach are the United States and Canada [9-13], among those who followed the second approach are

India and Brazil [14; 15; 16]. The experience of large countries such as the United States and Canada shows that decentralizing forest management becomes a proper strategy if there is an appropriate legal and institutional framework at the national level. Problems of forestry development are best solved at the local level. Changes aimed at decentralization should be combined with the establishment of strong guidelines at the regional level (for example, within the framework of regional forest development programs), the creation of an effective monitoring and control system to prevent uncontrolled use of forests for short-term political interests.

Institutional methods include specification of property rights, creation of a market for rights of use and competition, taxation, credit, certification, audit, insurance, easements, formation of public opinion and responsible environmental behavior.

Property relations form the foundation of the entire economic system of society and determine its functioning effectiveness, thereby creating an institutional basis for socio-economic and economic processes [17]. In most countries, various types of ownership of forest land are legally established. As a rule, this is state, private and communal (public) ownership of forests and forest lands. Regardless of the type of ownership, forest legislation is mandatory for all owners, and the state reserves the right to control the condition, use, protection of forests and reforestation. State forestry management with the predominance of a particular type of property has its own specifics [18]. Each country is searching for a "golden mean" in this issue, i.e. the ratio of types of property based on the existing social, economic and natural characteristics. Private ownership prevails in the United States, Finland, Sweden, and Germany [19; 20; 21], state property is in Canada [22; 23], Poland [24]. By changing ownership regimes, it is possible to influence people's behavior, since alternative regimes generate different incentive structures. However, you shouldn't choose one of the property regimes as a standard of reference. When making decisions on the development of private ownership of forests, it is necessary to study in more detail the features of the institutional environment in the country and try to conduct a multi-method interdisciplinary analysis of possible consequences.

Some scientists (see, for example, [25]) have tested the hypothesis that gradual forests privatization can help solve many problems of the industry in the country and move to the stage of its intensive development by creating economic incentives for sustainable forest management. The obtained conclusions indicate that there are no statistical grounds for rejecting the hypothesis of a positive impact of private ownership of forest land on the specific stocks of forest stands, but the revealed relationship is rather weak, indicating the need to study in more detail the features of the institutional environment of a particular country when making decisions on the development of forests private ownership.

The former socialist states, such as Romania, the Baltic States, the Czech Republic, and Slovakia, have gained some experience in transitioning from state to private ownership of forests [26; 27]. It shows that successful institutional reforms reveal some common elements [28]:

1) National forest policies and strategies should be the basis for institutional change, and not the reverse.

2) Direct relationships (administrative, financial) between the structures responsible for the implementation of state functions and management of state forests are eliminated in

order to avoid potential conflicts of interest; to ensure the independence, transparency and neutrality of the state forest management body.

3) Markets can be the best driving force for sustainable forest management, but they can lead to resource depletion without the necessary protective mechanisms.

4) Sustainable forest management provides the necessary framework for policy options analysis. Decisions on policy options should be preceded by a quantitative and qualitative assessment of their impact.

5) Stakeholder Participation and transparency are essential for evaluating policy options and implementing institutional changes.

It is obvious that other countries' experience cannot be applied in its pure form, it should be rethought taking into account the specifics of Russia's socio-economic conditions. Forest legislation should be reviewed in such a way as to create a clear institutional framework for business entities and ensure the achievement of long-term strategic goals related to sustainable forest management, taking into account their own experience.

3. The problems of forest management institutional system formation in the Russian Federation

The current model of forestry in the Russian Federation was established in the Forest code of 2006. Its content contains two main ideas: the vertical redistribution of power and the involvement of private businesses in forest management. This was to ensure, respectively, the effectiveness of management (the situation is better seen locally) and utilization (the presence of an economically interested owner). Thus, a number of state powers in the field of forest relations were transferred to the state authorities of the Federal subjects, and a long-term lease of forest plots became the main form of forest management.

It should be noted that in this case, the mechanism was launched almost "blindly". In fact, it was a kind of "trigger" for the implementation of ideas that had a rational basis, but were not fully developed. As a result, problems that had to be urgently addressed arose, since they were already encountered in real processes. They used to be "somehow resolved" in the current regime, and in the long term they were brought to the appropriate level of decision-making. Eventually, the rules of the game were adjusted. Sometimes it is not enough to make only one adjustment. All this continues to this day, naturally, causing a negative attitude on the part of the professional community. Moreover, some statements are rather harsh, for example: "This code violated the continuity with all the previous stage in the history of forest science and practice development" [8].

The following problems are highlighted among the main ones [8; 29]: the problem of forest ownership, in particular, the right to own forest resources has not been developed; there is no clear division of management rights between the subjects of forest relations (the Russian Federation, regions and forest users); there is no transparent procedure for granting rights to use forest plots; the existing institutional environment does not create conditions for public participation in the process of forest management; lobbying the interests of large capital contributes to the removal of medium and small forest businesses from the arena of forest relations, which entails adverse social consequences; the economic mechanism of lease relations is not perfect.

Paradoxically, the most discussed ideas are those that formed the basis of the Forest code. Various researchers express diametrically opposite points of view on the issue of centralization/decentralization of forest management, and the introduction of the

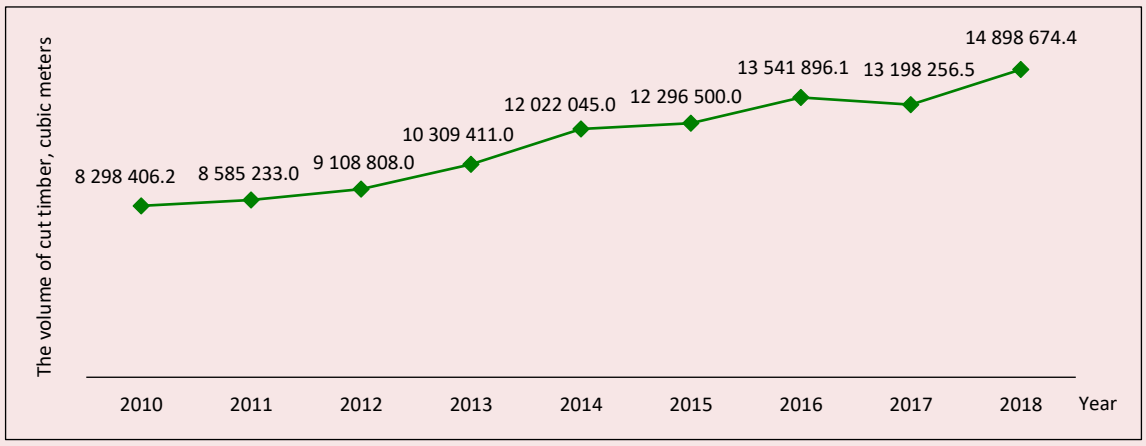
institution of private ownership of forests. Professor N.A. Moiseev insists that "it is important to return forest management from the regional level to the Federal one" [8]. At the same time, one of the possible scenarios described in the "Forecast of the Russian forest sector development until 2030" involves the transfer of part of the forest Fund's land to the ownership of the Russian Federation's constituent entities.

The issue of transferring forests to private ownership is even more controversial. Today, Russia is the only state among the top 10 countries-world loggers, where there is no private ownership of forest land [25]. However, most researchers agree that the country is being prepared for its appearance. Moreover, some of them believe that the existing system of long-term lease is already becoming a kind of private property [18]. This is partly confirmed by the "Forecast of the Russian forest sector development until 2030". The document indicates the implementation of the provision of article 9 of the Constitution of the Russian Federation determining the privatization of forest lands and the emergence of private forests as a possible scenario for the development of the forest relations system. It is claimed that the soil has already been prepared for this purpose by the current Forest code, in which a forest plot is declared as a plot of land. This practically means that forest relations are included in the system of land relations, where private ownership of land has already been recognized for a long time; leased forest plots are subject to state cadastral registration with boundary marking; leased forest plots are subject to state registration of rights and transactions. However, many researchers are inclined to believe that it is still premature to introduce the institution of private ownership of forests, as, first, it is negatively treated by the population as they see a potential infringement of their rights in free forests visiting and meeting their needs for forest goods; secondly, it is necessary to take into account the risk of inefficient and sometimes destructive activities of the owner in relation to the forest, which can lead to serious consequences [25]. Sergey Anoprienko, Deputy Minister of natural resources and ecology of the Russian Federation, head of the Federal forestry Agency, said at the forum "LPC 360°: from all points of view": "In modern realities, private ownership of forests does not seem to be appropriate"[2]. His following statement caused the general consensus: "We can return to this issue only after careful consideration of all possible threats, taking into account the opinions of environmentalists, the expert community, the country's leadership, and when there is a common understanding of how effectively this will solve the existing problems of the forest industry".

The most reasonable opinion, from our point of view, is expressed by G.B. Kozyreva: "The main thing is not who is the owner of forest resources, but how his rights are specified" [29]. It is necessary to understand how thoroughly the existing system of forest ownership in Russia has been studied. According to the developers of the current Forest code, the institutional environment for long-term lease of forest plots in a socially oriented market economy and state ownership of the forest Fund should have ensured a balance of interests of the state, business and society in the framework of sustainable forest management. In this regard, it is necessary to understand the patterns and relationships that underlie the development of the forest lease system. This is what will make it possible to model its dynamics and determine its prospects.

[2] *LesPromInform magazine*. Available at: https://lesprom-inform.ru/news.html?id=11802 (accessed: 19.12.2019).

Figure 1. Dynamics of timber cutting on the territory of the Vologda Oblast by tenants who signed a lease agreement for logging purposes, for the period of 2010–2018, cubic meters



Source: compiled by the authors on the basis of information from the website of the Department of forestry of the Vologda Oblast (https://dlk.gov35.ru); Vologda Oblast open data portal (http://data.gov35.ru/).

The current system of assessment of the lease institute operates only with general parameters (volume of logging, area of reforestation, etc.). They characterize the effectiveness of the system at a certain point in time, but cannot give an answer about the reasons for its behavior. However, it is the indicators that characterize the parameters of the development of individual elements of the system over time that can be used, first, to search for various dependencies, and second, to form the models. Our analysis has proved that there are currently no works dedicated to this topic. In this regard, the authors studied the dynamics of development of leasing forest land system on the territory of the Vologda Oblast, which occupies one of leading places among regions of Russia on the availability of forest resources. The total area of its forests is 11.473 million hectares (79% of the region's territory). Timber reserves exceed 1.6 billion cubic meters. The annual allowable cut is 29.729 million cubic meters, including 10.6 million cubic meters of coniferous forests. 18.251 million cubic meters of wood were leased to forest users. 1021 forest lease agreements have been signed. The dynamics of wood harvesting by tenants who have signed a lease agreement for logging purposes is shown in (*Fig. 1*).

4. Analysis of the dynamics of forest plots lease system formation in the Vologda Oblast

Two main elements of the system were analyzed: forest plots leased (lease agreements) and tenants. We studied how the parameters of these elements are formed, and considered the dynamics of their development over time. Besides, attention is drawn to the possibility of their use in creating agent-oriented models for the development of the regional forest complex. The authors focused on publicly available sources of information, containing mainly the data from the Department of forestry and the Vologda Oblast open data portal[3].

Vologda Oblast is a fairly large region in the North-West of the European part of the Russian Federation. On the territory of the region's municipal districts, there are 26 forestries operating. The parameters of each of them

[3] *Vologda Oblast open data portal*. Available at: http://data.gov35.ru/

Table 1. The total land area of the forest Fund of the Vologda Oblast forestries and the average volume of cut timber per hectare on their territories in 2018

District forestry	Total land area of the forest Fund, ha	Average volume of cut timber per hectare, cubic meters/ha
Babaevskoye	835 548	1.233915945
Babushkinskoye	691 366	1.387130261
Belozerskoye	452 463	1.543447752
Vashkinskoye	247 167	1.172021346
Velikoustyugskoye	637 788	1.755426568
Verkhovazhskoye	366 212	1.937440062
Vozhegodskoye	501 442	0.968301419
Vologodskoye	225 126	0.507822286
Vytegorskoye	1 218 900	1.345413898
Gryazovetskoye	381 770	1.545564083
Kaduyskoye	257 466	0.807928037
Kirillovskoye	350 838	0.45501599
Kichmengsko-Gorodetskoye	606 129	1.366542436
Mezhdurechenskoye	304 815	1.148946082
Nikol'skoye	644 844	1.67413514
Nyuksenskoye	461 344	1.303179406
Sokol'skoye	294 988	1.285174312
Syamzhenskoye	327 564	1.565391801
Tarnogskoye	437 666	1.277743759
Totemskoye	736 192	1.517003716
Ust-Kubinskoye	168 402	0.997612855
Ustyuzhenskoye	273 058	0.313541445
Kharovskoye	281 715	1.670390288
Chagodoshchenskoye	200 834	0.705249111
Cherepovetskoye	427 033	1.236391567
Sheksninskoye	141 835	0.514844714
Compiled on the basis of: the information on the website of the Department of forestry of the Vologda Oblast (https://dlk.gov35.ru); the information from the Vologda Oblast open data portal (http://data.gov35.ru/); forest technical regulations of Vologda Oblast forestries.		

have their own specifics, which must be taken into account. It is quite difficult to evaluate the characteristics of manifold objects and then ensure their formation and support in the model, so the authors suggest an approach according to which the forestries are divided into clusters. It is based on the principle of placing them in the space "Land area of the forest Fund – Average volume of timber cut per hectare". The parameter values for each forestry are shown in *table 1.*

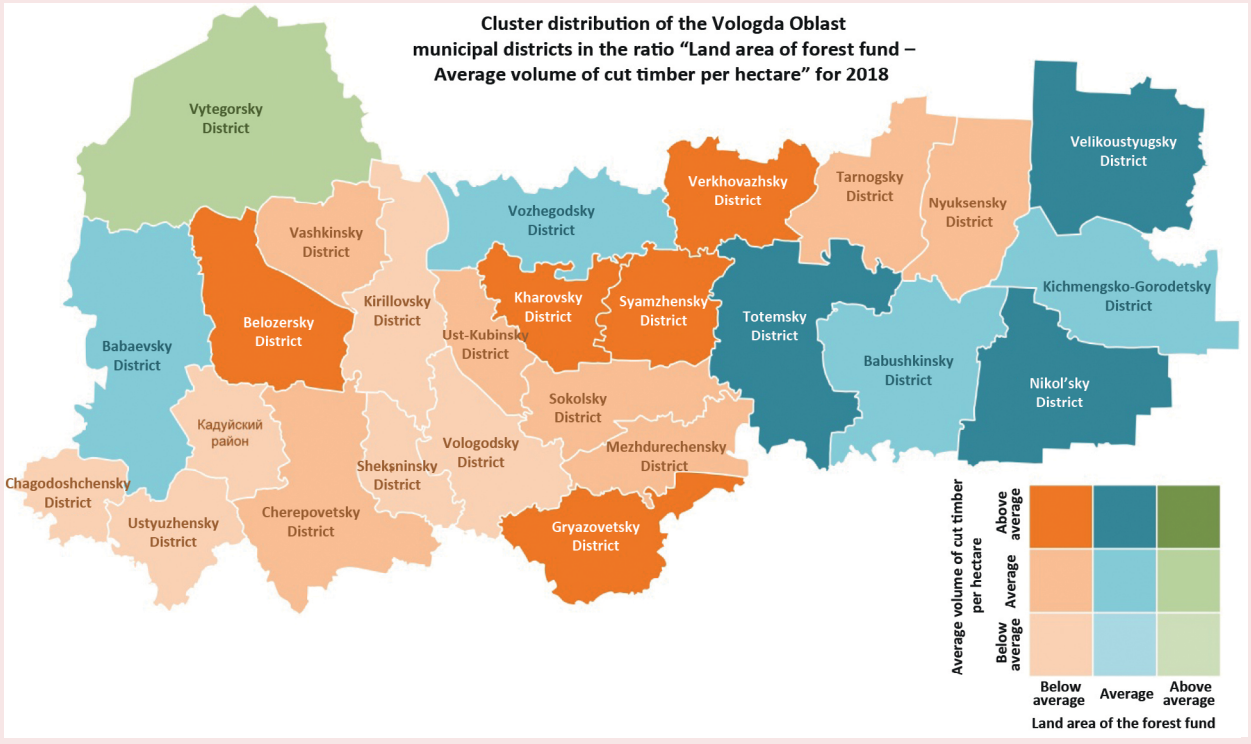
Space dimensions were selected on the basis of the fact that these indicators in their entirety can characterize the formation of forest plots for rent and tenants. The space was divided into nine clusters by dividing it equally vertically and horizontally by the parameters of the forest land area and the average volume of cut timber per hectare (below average, average and above average). The total area boundaries of the clusters are determined based on the minimum and maximum values of these indicators. As a result, all forestries were located in six clusters (*Fig. 2*).

The geographic representation of the forestries distribution in the space "Land area of forest Fund – Average volume of cut timber per hectare" on the map of the Vologda Oblast is of interest (*Fig. 3*). Its more detailed interpretation can be presented in a separate

Figure 2. Graphic display of the Vologda Oblast forestries in the space "Land area of forest Fund – Average volume of cut timber per hectare"

Source: compiled by the authors.

Figure 3. Geographic display of the forestries distribution in the space "Land area of forest Fund – Average volume of cut timber per hectare"



Source: compiled by the authors.

work related to the overlay of locations of various infrastructure facilities, enterprises on the map, the consideration of individual characteristics of territories, such as population density, and other elements. In this study, we only believe that representatives of the same cluster have similar characteristics in the dynamics of the forest lease system development.

The following notations are used when identifying the clusters: NP – below the average indicator of forest Fund land area; SP – the average indicator of forest Fund land area; VP – above the average indicator of forest Fund land area; NO – below the average indicator of the average volume of cut timber per hectare; SO – the average indicator of the average volume of cut timber per hectare; VO – above the average indicator of the average volume of cut timber per hectare. Thus, the notation "VP:SO" means that the territory belongs to the cluster "Above the average indicator of forest Fund land area – The average indicator of the average volume of cut timber per hectare". One representative forestry from each of the four clusters was selected for further analysis: Vologodskoye (NP:NO cluster), Mezhdurechenskoye (NP:SO cluster), Kharovskoye (NP:VO cluster) and Nikolskoye (SP:VO cluster). Due to the small number of participants in the remaining two clusters, it was decided to select one forestry that is closest to their common border, the Babaevskoye forestry (clusters SP:SO and VP:SO).

The general purpose of the lease agreements dynamics analysis was to determine the trends in the development of the amount and area of the leased land plots, as well as the lease duration. This will allow further modeling of the processes of changing their overall structure, since in reality they are mostly random in nature.

In accordance with the existing legislation, it is possible to lease forest plots for various purposes. The current distribution of lease agreements by type of use in the Vologda Oblast is shown in *figure 4*.

Figure 4. Distribution of lease agreements by the types of use in the Vologda Oblast

Type of lease	Number of plots	Land area of plots, ha
Harvesting of food forest resources and collecting medicinal plants	1	44577
Activities in the hunting sector	17	163056
Farming	10	17.9434
Research and educational activities	3	343.2
Recreational activities	72	135.9251
Growing of planting material of forest plants (saplings, seedlings)	3	16.5816
Performing works on the geological study of subsurface resources, development of mineral deposits	74	631.8932
Construction and operation of reservoirs and other artificial water bodies, as well as hydraulic structures, seaports, sea terminals, river ports, berths	63	245.2401
Construction, reconstruction, and operation of linear facilities	360	7101.9976
Religious activities	1	0.11
Performing survey work	4	0.6427
Timber cut	504	6870027.14

Source: compiled by the authors on the basis of the information from the website of the Department of forestry of the Vologda Oblast (https://dlk.gov35.ru); the information from the Vologda Oblast open data portal (http://data.gov35.ru/).

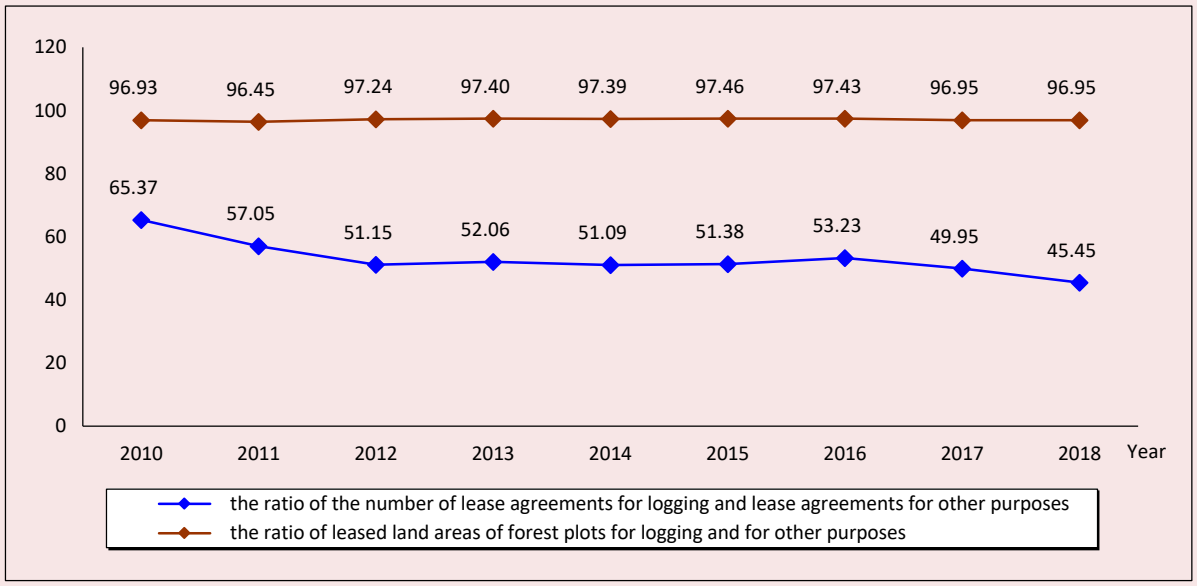
If quantitatively the lease agreements for logging and other purposes are approximately the same, then the largest share of the leased land area is accounted for by logging. The dynamics of time series of the ratio of the quantity of lease agreements for logging purposes and lease agreements for other purposes, as well as the land areas indicated in them (*Fig. 5*) shows that over the nine years (from 2010 to 2018), the ratio of areas remains almost unchanged making up about 97% in favor of lease agreements for logging purposes. At the same time, in terms of quantity, a trend of increasing the share of contracts for other purposes is obvious.

Based on the presented graphical representation of the dependency, we can talk about its linear nature. Using the linear approximation tools of Microsoft Excel software, the following function of trend change in the ratio of the number of lease agreements for logging and lease agreements for other purposes was obtained: $y = -0.0162x + 0.6109$, with the approximation confidence value $R^2 = 0.6427$. Obviously, this functional relationship has time constraints, but it can be used for short- and medium-term forecasts. In addition, when developing an intensional model [30], you can change its parameters when new data about the current development of the modeled system is received.

Similar dependencies exist in the time series of the quantity of lease agreements for logging and other purposes, as well as the areas of leased forest plots indicated in them. The corresponding diagrams and functional dependencies are shown in *table 2*.

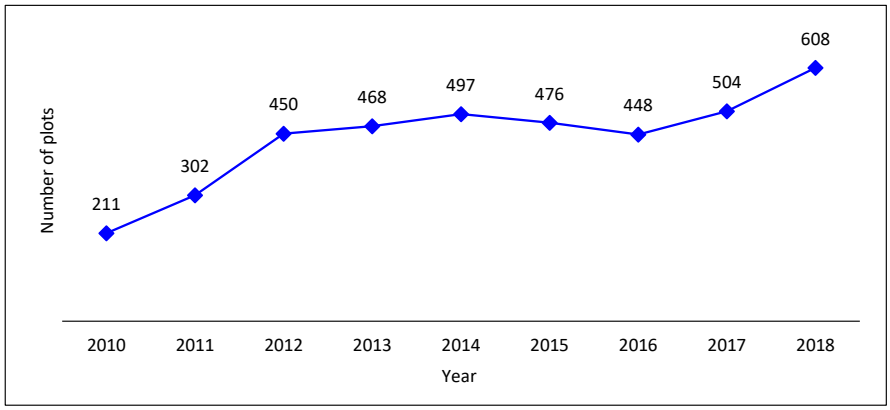
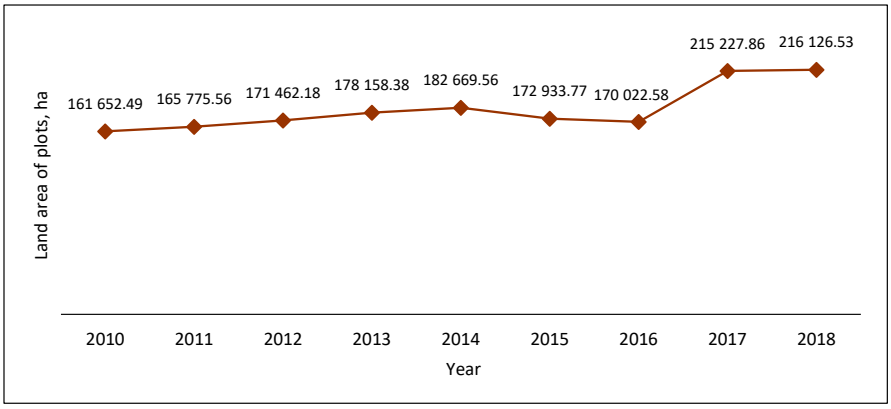
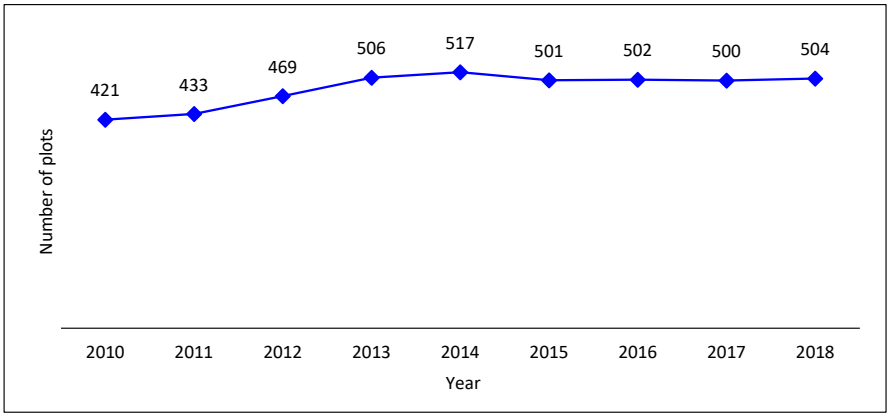
When making forecasts within the clusters using the obtained equations, the initial values of the parameters of territories included in the cluster should be taken into account. Thus, the calculation of the projected figure on a certain territory should have the following order: first, one computes the value of the equation on the projected indicator for the cluster to which

Figure 5. Dynamics of the ratio of the quantity of lease agreements for logging purposes and lease agreements for other purposes, as well as the land areas indicated in them, for the period 2010–2018



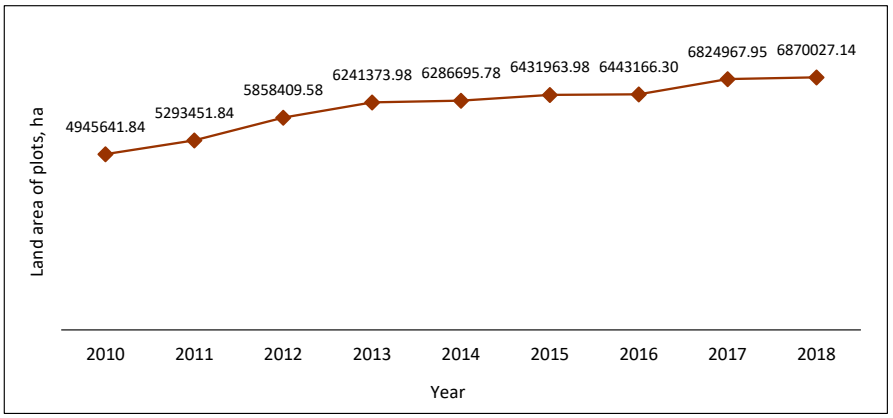
Source: compiled by the authors on the basis of the information from the website of the Department of forestry of the Vologda region (https://dlk.gov35.ru); the information from the Vologda region open data portal (http://data.gov35.ru/).

Table 2. Diagrams and functional dependencies in time series of the quantity of lease agreements for logging and other purposes, as well as the areas of leased forest plots indicated in them

Time series diagram	Dependency equation received by linear approximation / R-squared value
Change in the number of plots under lease agreements for purposes other than logging (in the region)	
	$y = 36.633x + 257.28$ $R^2 = 0.7367$
Change in the area of land plots under lease agreements for purposes other than logging, ha (in the region)	
	$y = 5969.2x + 151713$ $R^2 = 0.6486$
Change in the number of plots under lease agreements for logging purposes (in the region)	
	$y = 9.9x + 434.17$ $R^2 = 0.6103$

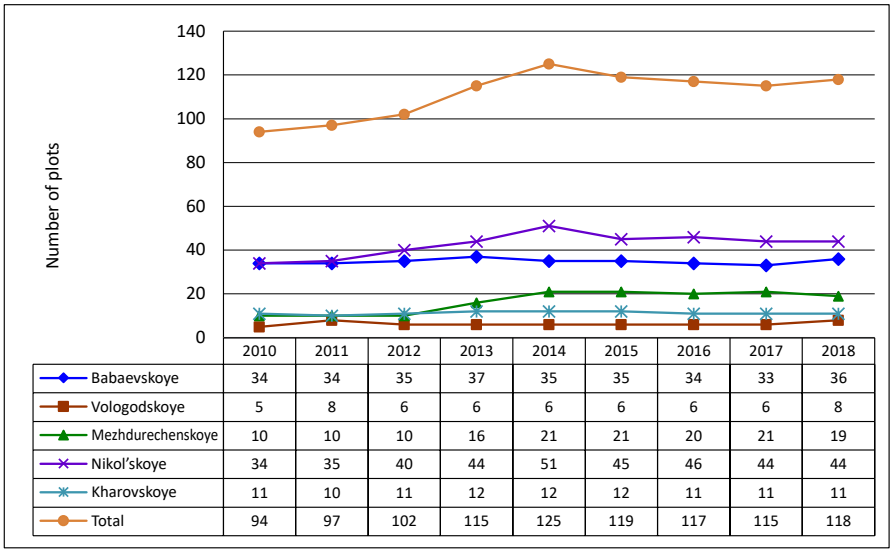
End of Table 2

Change in land area of plots under lease agreements for logging purposes, ha (in the region)



$y = 227537x + 5E + 06$
$R^2 = 0.9048$

Changes in the number of plots under lease agreements for logging purposes (by cluster)



	2010	2011	2012	2013	2014	2015	2016	2017	2018
Babaevskoye	34	34	35	37	35	35	34	33	36
Vologodskoye	5	8	6	6	6	6	6	6	8
Mezhdurechenskoye	10	10	10	16	21	21	20	21	19
Nikol'skoye	34	35	40	44	51	45	46	44	44
Kharovskoye	11	10	11	12	12	12	11	11	11
Total	94	97	102	115	125	119	117	115	118

SP:SO and VP:SO (Babaevskoye)
$y = 0.0167x + 34.694$
$R^2 = 0.0014$

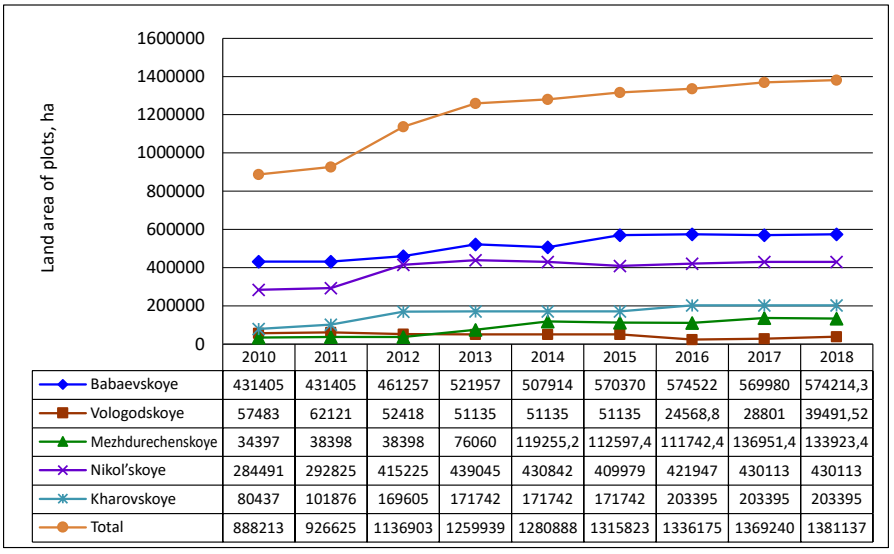
NP:NO (Vologodskoye)
$y = 0.1x + 5.8333$
$R^2 = 0.075$

NP:SO (Mezhdurechenskoye)
$y = 1.5667x + 8.6111$
$R^2 = 0.7141$

SP:VO (Nikolskoye)
$y = 1.3333x + 35.889$
$R^2 = 0.4593$

NP:VO (Kharovskoye)
$y = 0.05x + 10.972$
$R^2 = 0.0422$

Change in land area of plots under lease agreements for logging purposes, ha (by cluster)



	2010	2011	2012	2013	2014	2015	2016	2017	2018
Babaevskoye	431405	431405	461257	521957	507914	570370	574522	569980	574214,3
Vologodskoye	57483	62121	52418	51135	51135	51135	24568,8	28801	39491,52
Mezhdurechenskoye	34397	38398	38398	76060	119255,2	112597,4	111742,4	136951,4	133923,4
Nikol'skoye	284491	292825	415225	439045	430842	409979	421947	430113	430113
Kharovskoye	80437	101876	169605	171742	171742	171742	203395	203395	203395
Total	888213	926625	1136903	1259939	1280888	1315823	1336175	1369240	1381137

SP:SO and VP:SO (Babaevskoye)
$y = 21032x + 410733$
$R^2 = 0.8819$

NP:NO (Vologodskoye)
$y = -3793.7x + 65445$
$R^2 = 0.6605$

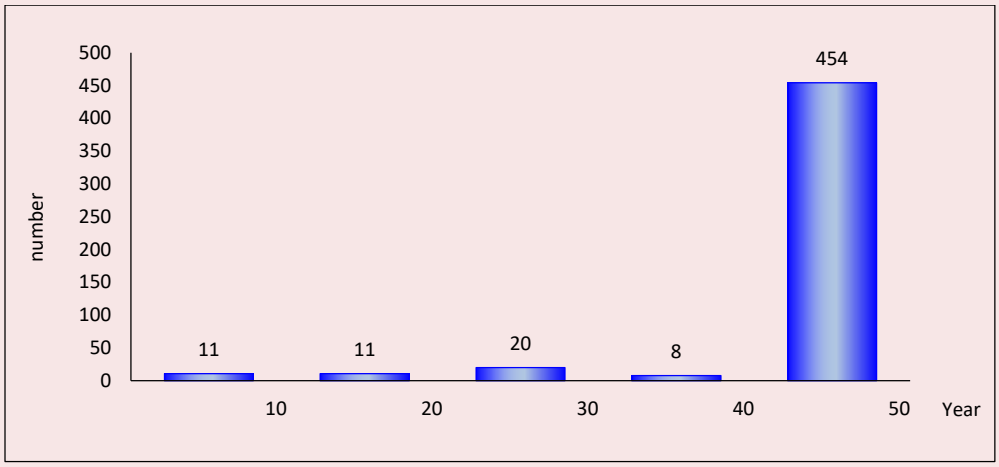
NP:SO (Mezhdurechenskoye)
$y = 14617x + 15998$
$R^2 = 0.8794$

SP:VO (Nikolskoye)
$y = 16312x + 313393$
$R^2 = 0.5375$

NP:VO (Kharovskoye)
$y = 14399x + 92150$
$R^2 = 0.7919$

Compiled on the basis of: the information on the website of the Department of forestry of the Vologda Oblast (https://dlk.gov35.ru); the information from the Vologda Oblast open data portal (http://data.gov35.ru/).

Figure 6. Histogram of the distribution of forest plots lease duration in the Vologda Oblast



Source: compiled by the authors on the basis of the information from the website of the Department of forestry of the Vologda Oblast (https://dlk.gov35.ru); the information from the Vologda Oblast open data portal (http://data.gov35.ru/).

the territory is related to, and then the difference between the initial values of the projected figure of territory selected as basis for the cluster and the projected indicator of the territory for which the predictions are made, is subtracted from it.

Histogram of lease duration distribution is presented in *figure 6*.

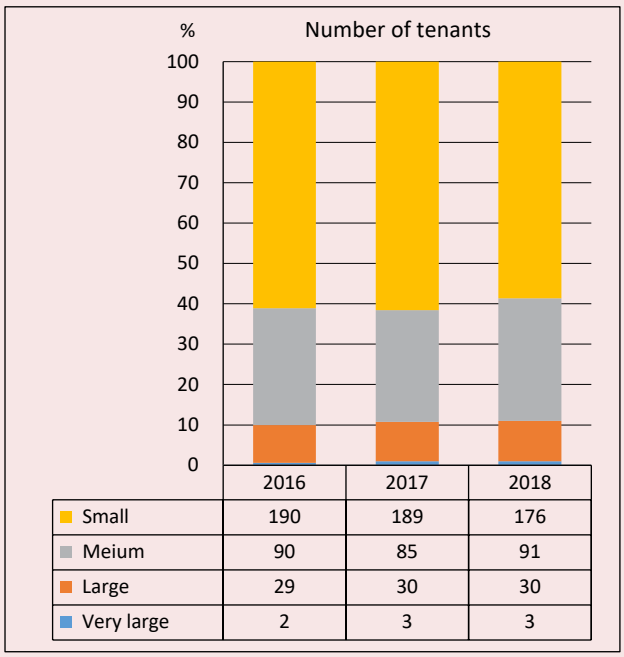
A significant preponderance of lease agreements with a duration of more than forty years is presented. In this case, it is difficult to choose the distribution law, so for modeling purposes, it is advisable to use a discrete probability distribution when forming the lease duration under the contract. At the same time, the presented histogram is used to determine the intervals and probability values, taking into account that the current legislation limits the range of possible lease terms for a forest plot to 10-49 years.

The general purpose of the analysis of the composition of forest plots tenants was to determine the dynamics of changes in their quantitative composition, taking into account production capabilities. Tenants with different capabilities differ in their behavior patterns, so during the analysis the tenants were divided into four groups depending on the annual volume of timber cut4: very large (more than 500 thousand cubic meters); large (from 100 to 500 thousand cubic meters); medium (from 20 to 100 thousand cubic meters); small (less than 20 thousand cubic meters). It can be assumed that the behavior of each tenant in certain situations will be similar to the behavior of any other tenant belonging to this group. The ratio of the number of tenants and the number of leased plots by groups in dynamics (2016–2018) is shown in *figure 7*. It is revealing that with the almost constant number of very large and large tenants, the number of leased plots increases due to a decrease in the share of the number of leased plots by small tenants.

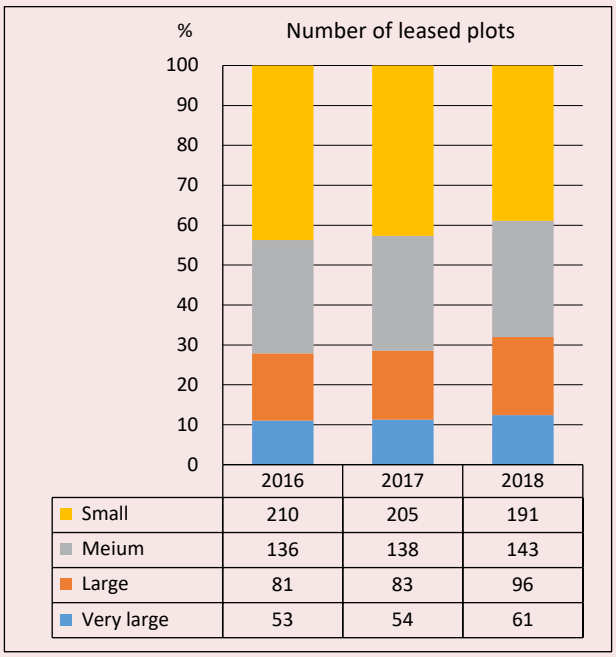
The time series of the number of tenants of forest plots in the Vologda Oblast by groups for the period of 2011–2018 are shown in *Fig. 8*.

[4] Logging in Russia: state and target vision. *ProDerevo*. Available at: https://proderevo.net/industries/wooden-logging/lesozagotovka-v-rossii-sostoyanie-i-tselevoe-videnie.html (accessed: 19.12.2019).

Figure 7. The ratio of the number of tenants and the number of leased plots by groups for the period of 2016–2018



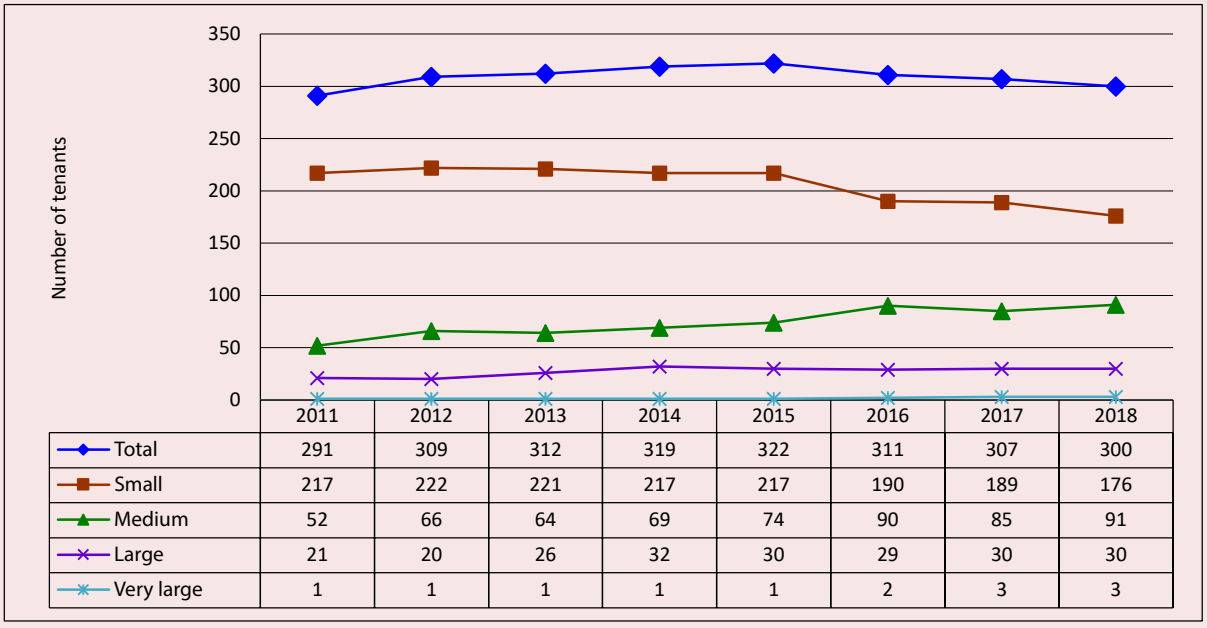
	2016	2017	2018
Small	190	189	176
Meium	90	85	91
Large	29	30	30
Very large	2	3	3



	2016	2017	2018
Small	210	205	191
Meium	136	138	143
Large	81	83	96
Very large	53	54	61

Source: compiled by the authors on the basis of the information from the website of the Department of forestry of the Vologda Oblast (https://dlk.gov35.ru); the information from the Vologda Oblast open data portal (http://data.gov35.ru/).

Fig. 8. Time series of the number of tenants of forest plots in the Vologda Oblast by groups for the period of 2011–2018



	2011	2012	2013	2014	2015	2016	2017	2018
Total	291	309	312	319	322	311	307	300
Small	217	222	221	217	217	190	189	176
Medium	52	66	64	69	74	90	85	91
Large	21	20	26	32	30	29	30	30
Very large	1	1	1	1	1	2	3	3

Source: compiled by the authors on the basis of the information from the website of the Department of forestry of the Vologda Oblast (https://dlk.gov35.ru); the information from the Vologda Oblast open data portal (http://data.gov35.ru/).

Table 3. Trend functions of changes in the time series reflecting the number of tenants of forest plots in the Vologda Oblast

Tenants	Dependency equation obtained by linear approximation / the value of reliability approximation
Very large	$y = 0.3214x + 0.1786$ $R^2 = 0.7386$
Large	$y = 1.4286x + 20.821$ $R^2 = 0.6058$
Average	$y = 5.369x + 49.714$ $R^2 = 0.9043$
Small	$y = -6.4881x + 235.32$ $R^2 = 0.7724$
All	$y = 0.631x + 306.04$ $R^2 = 0.0242$
Compiled on the basis of the information from the website of the Department of forestry of the Vologda Oblast (https://dlk.gov35.ru); the information from the Vologda Oblast open data portal (http://data.gov35.ru/).	

Using the linear approximation tools of Microsoft Excel software, we obtained trend functions for each group with respect to changes in the time series of the number of tenants (*Table 3*).

5. Conclusion

The dynamics of the development of a system including the lease of forest plots depends on many different factors. Determining their full list and the nature of their impact on the system is a complex task that has no solution to date. Approaches reflected in the paper allow to quantify the trends of key elements of the system of rent, as well as to forecast the values of their parameters in future periods and to determine the degree of system response to external interferences (including control). They are based on the models obtained by linear approximation of trends in the development of parameters of the corresponding elements.

The approaches are tested by the authors on the example of the system of lease of forest plots in the Vologda Oblast. On the basis of the available historical data, we have obtained the dependencies using which in the short term it is possible to predict changes in the number and area of leased land, the number of tenants, and the lease term. Thus, in accordance with the Forest plan of the Vologda Oblast, approved by the order of the Governor of the Vologda Oblast dated November 30, 2018, no. 4807-R, for the period of 2018–2027, in Babaevskoye forestry, it is planned to provide three plots with a total area of 6302 hectares for logging purposes. According to forecasts obtained by means of the models developed by the authors, in 2027, compared to 2017, the number of leased plots will increase twice, and their area will increase by 219329 hectares. In the course of further research, the authors plan to make a more detailed interpretation of the obtained models on the example of the forest complex of the Vologda Oblast.

This work contributes to the development of theoretical approaches to the methodology for studying the dynamics of the institutional environment formation associated with the lease of forest plots in the region of the Russian Federation and applied aspects of its modeling. Practical significance of the research consists in providing an opportunity to determine the main trends in the development of elements of the forest lease system, making forecasts of their development, and using the results in the construction of various models of the forest complex.

To date, the authors of the paper have developed a number of agent-oriented models of the regional forest complex, including a model of reforestation [31]. It contains three types of agents: a forest plot, a tenant, and a government Agency. The general structure of forest plots and tenants is considered in statics, i.e. only agents corresponding to the situation at the beginning of the simulation are created and function in the model. Using the developed approaches, it becomes possible to more adequately describe the processes taking place due to the formation of dynamics of changes in the model elements. This can fully apply to other models of the regional forest complex, since the elements considered are basic in this subject area. The authors analyzed the development of the forest lease system in the Vologda Oblast and obtained the models for the formation of its main elements.

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The Assessment of the Impact of the Economy's Development on Air Pollution*

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Abstract. The economic growth has a negative impact on the environment, that is why the development of models, which would reveal the influence of different factors on the change of the environment, is necessary. In order to study environmental and economic processes, a new approach was proposed, and special models, which allow assessing the impact of the investment policy and environmental activities, were created. It gives an opportunity to link the change of the environment with approved management decisions. The purpose of the article is to identify reasons that cause transformations of the interconnection between economic and environmental indicators, to study the impact of the change of environmental legislation and other external shocks on environmental and economic processes in the Russian Federation and the European Union on the example of air environment. The relevance and significance of this work is determined by changes of environmental legislation in the Russian Federation, which is currently based on the best available technologies (BAT), and the need to build models that would allow predicting the development of environmental and economic processes in changing interconnections of indicators within the emerging practice of applying new legislation. The novelty of the research is the development of models, which allow analyzing the impact of external shocks on environmental and economic processes, on the basis of the proposed approach. Empirical analysis of data was carried out, and models of environmental and economic processes were constructed. It turned out that the change of EU legislation did not lead to a sharp transformation of existing interconnections between economic and environmental indicators, which were associated with economic crises. Crises may contribute to the emergence of a new trend or just bring the system out of balance for a few years, but later its development will again be described by equations similar to pre-crisis ones. The study also allowed us to explain the improvement of environmental indicators with the growth of Russian and EU economies. Its results may be used in the development of strategic documents for the development of regions and countries. Further studies are related to the assessment of various scenarios for the development of regions of the European North of the Russian Federation.

Key words: economic development, environmental protection investments, modernization, structural shifts, model, emissions of pollutants into the atmosphere, greenhouse gases.

Introduction

The development of the economy affects the state of the environment, but this influence may vary. The expansion of existing production facilities and the creation of new ones increase the impact on the environment, contributing to the deterioration of atmospheric air and water and the increase of the amount of generated waste. At the same time, structural shifts, associated with the emergence of new enterprises instead of closed ones with outdated technologies, modernization, re-profiling of organizations, and the transition to new technologies may reduce the negative impact on the environment.

Attention to the state of the environment contributed to the increase of interest to the development of models for the identification of factors that affect environmental processes and assess their impact on the environment. Initially, the IPAT identity approach was used, which allowed us to approximately estimate the impact of population dynamics, levels of the country's development and its technological level [1; 2]. Later, T. Dietz, E. Rosa proposed stochastic STIRPAT model, which helps reveal and assess the impact of different factors more precisely [3; 4; 5]:

$$E_i(t) = A \times P_i^{\alpha}(t) \times Y_i^{\beta}(t) \times T_i^{\gamma}(t), \quad (1)$$

where $E(t)$ – studied environmental indicator;

$Y(t)$ – indicator describing the degree of the economic development;

$P(t)$ – population size;

$T(t)$ – technological level;

i – country (region);

t – year;

α, β, γ – constants.

The technological level was usually determined through the amount of specific emissions. The degree of the economic development was characterized by a value of gross domestic product (GDP) per capita.

The proposed approach was developed, the theoretical justification of the model was clarified, and new countries and regions were analyzed. Equation (1) allowed increasing the number of factors and introducing other conditions that may have a noticeable impact on the environmental situation. First of all, the impact of the urbanization and changes of the economy's structure – the share of industry, agriculture, services, and other industries – were studied.

The problem was the selection of an indicator that reflects scientific and technological progress. Various options were considered, for example, the energy intensity of industry and the share of the consumption of energy obtained from alternative sources [6]. Based on EU countries' data, it was shown that innovation activities affect the level of carbon dioxide (CO_2) emissions [7].

According to numerous foreign studies, the dependence of environmental pollution on GDP may have different forms, and it is mainly determined by the level of technological progress and the activity of structural changes in the economy. The influence of external shocks and different levels of fuel and energy prices were considered significant factors in some studies [8; 9].

In addition to the equation (1), other approaches were used. In the framework of the research of the Kuznets environmental curve (KEC), it was shown that the growth of urbanization may reduce the level of CO_2 emissions with a high level of GDP per capita and a large share of service industries in GDP [10]. Close theoretical results were acquired by M. Mazzanti, A. Montini during the study of regional data in Italy [11]. However, the most noticeable contribution to the decrease of CO_2 emissions, as shown by G. Müller-Fürstenberger and M. Wagner on the basis of special analytical model [12], is provided by the scientific and technical progress (transition to new technologies).

While studying KEC, S.N. Bobylev noted the connection between the level of income and the sustainable development [13]. In accordance with KEC hypothesis, it is assumed that the increase of output growth is accompanied by the growth of negative impact on the environment only until a certain threshold value (during an early period), then the level of pollution begins to decrease, despite continuing economic growth. Calculations, based on Russian data, showed that the interconnection between the gross regional product (GRP) and emissions of pollutants into the atmosphere is described by KEC only for, approximately, twenty regions of the Russian Federation. Main factors, contributing to the reduction of the environmental burden, were the active modernization of production facilities and structural changes of these regions' economy [14].

To a large extent, the decrease of the environmental burden in Russian regions in the 2000s was caused by the rapid growth of the service sector and the reduction of the share of industry, which was the main polluter [15]. I.A. Zabelina, while studying regions bordering

fast-growing China, identified the presence of the decoupling effect in the negative impact on atmospheric air in most regions [16].

Due to climate changes occurring in recent decades, the attention is focused on greenhouse gas emissions, primarily CO_2. Dynamics of atmospheric air and water pollution by other substances is analyzed less often. It should be noted that the results for various pollutants significantly differ.

Most studies of greenhouse gases are conducted on the basis of panel data from countries with different development levels; only a part of them covers countries situated on one continent or macroregion. Studies for 214 countries showed that the degree of the factors' impact depends on the level of GDP per capita, and the signing of the Kyoto protocol is important for countries with high incomes, except the number of population, the share of industry in GDP, and energy efficiency of the economy [17]. In 45 African countries, the economy of which is related to extractive sector, besides GDP per capita, energy intensity and, in some cases, the level of industrialization, the level of urbanization, and the number of able-bodied population are important [18].

In many studies, the impact of the population growth turned out to be significant. 1% population growth leads to the increase of emissions by more than 1% [5; 19; 20; 21]. At the same time, it should be noted that parameter values, obtained by different authors, vary; it depends on the selection of studied indicators. For example, B. Liddle [6] notes that maximum values were obtained, when demographic indicators were used as additional indicators. While using the share of industry or the energy intensity of the economy as characte-ristics of the technological level, the significance of the population was significantly less.

There are other differences: for developed countries, the share of able-bodied population negatively affects overall CO_2 emissions, and, at the same time, this impact is positive for other countries [22]. The influence of urbanization is also controversial. In P. Sadorsky's review, it is noted that, in developing countries, its growth causes the increase of emissions, and such impact is statistically important [23].

There are significantly fewer studies on regional data, and most studies analyzed Chinese regions [24; 25; 26]. It was shown that the most important factor for reducing CO_2 emissions was the change of the technological level and the industry's structure [27]. In some studies, regions were divided into groups depending on their characteristics, such as the level of GRP per capita. In the group with the highest GRP per capita, the energy-related factor became the determining one, in the middle group – factors of urbanization, industrial structure, and external trade, in the third group – the dynamics of the population and GRP per capita [28].

Slightly different results were obtained in the work of V. Lantz, Q. Feng [9] while assessing data across Canadian regions. Here, there is no dependence of greenhouse gas emissions on GRP; the largest impact is caused by the number of population, the technological level, the share of exports and imports, the share of industry in the structure of the region's economy, and the price of crude oil. The situation varies in countries and regions even in terms of gas only.

There are fewer studies on the dynamics of other gases' emissions into the atmosphere. They show that research and development expenditures and other indicators, related to the technological progress, significantly affect the emissions of sulfur and nitrogen compounds [10; 29]. J. Kramer established the dependence of the dynamics of SO_2, nitrogen compounds, and solid substances emissions on the population in California [30].

G. Marin and M. Mazzanti [31], using panel data, showed that, in different spheres of Italian economy, the interconnection between the anthropogenic impact and the economic growth differs, decoupling effects and increased emissions into the atmosphere with increased production volumes are possible. Scientists confirmed the hypothesis on the growth of the environmental burden as the volume of manufacturing production increases. They identified the most problematic sectors of the economy according to the level of this burden.

There are not enough studies exploring the impact of the economic development on the environment according to time series of a single country or a region. For example, in Chinese regions Guangdong and Minhang, the most significant factors were the urbanization level and technological level associated with energy consumption per GRP unit, as well as the level of industrialization, the share of services in GRP, the number of population and GRP per capita [25; 26].

Even fewer works touch upon the effectiveness of the environmental policy. Greek researchers G. Halkos and E. Paizanos used panel data of 77 countries for 1980–2000 to show the direct and indirect impact of government expenditures on the environmental protection, and the efficiency of expenditures for different types of pollution differ greatly [32].

Among all factors, the impact of the investment policy and environment protective activities is less studied. Only some works examine the connection between investments in environmental protection and pollution [33; 34; 35]. During the construction of dependencies, it was usually assumed that they do not change over time, and they do not have external shocks – global economic crises, changes in legislation, and others. In some countries, scientists begin to review the impact of changes in legislation on environmental and economic processes (for example, R. Almgren in Sweden), but there is no work on its assessment on the basis of models [36].

To study environmental and economic processes in the Russian Federation and its regions, an approach was proposed in which three groups of factors are identified for the analysis of changes in dependencies over time: those that affect the environment negatively, positively, and factors which may have a positive and negative impact. Special models were constructed: it allowed to link the structure and dynamics of investments with dynamics of various types of pollution according to the data of the Russian Federation and its regions, revealing the influence of economic policy and economic crises on changes in environmental and economic interdependencies [37; 38]. The novelty of the proposed approach is related to the fact that the study of time series on the basis of these models makes it possible to assess the impact of various external shocks on changes of existing trends and interconnections.

The purpose of the article is to identify reasons that cause transformations of the interconnection between economic and environmental indicators, to study how changes of the environmental legislation and other external shocks are related to environmental and economic processes in the Russian Federation and the European Union on the example of air environment. The following objectives were solved: the collection of information on environmental and economic processes in the RF and the EU, including changes in the legislation; the development of models for accounting the impact of external shocks, including changes in the legislation and economic crises; the assessment on the basis of models of external shocks' impact on the relationship between economic and environmental indicators.

The relevance and significance of the conducted research are determined by the change of environmental legislation in the Russian Federation, which is based, at the moment, on best available techniques (BAT), the need to build models that would predict the development of ecological and economic processes in transforming interconnections of indicators within the implementation of the new legislation. The proposed approach helps to analyze possible environmental consequences of the economic development, to build scenario conditions based on special models and to compare the impact of various economic policy options on the environment, to make more reasonable forecasts during the development of strategic documents, and to analyze various options for the investment policy and regional development.

Methodology and data

In addition to existing models (1), pollution functions were proposed. They allow us to explore different investment distribution options, to assess the impact of changes in the structure of the economy, and to take into account the impact of the environmental policy, considering the dynamics of investments and costs associated with the environmental protection. We used specific indicators of Russian statistical reports that allow analyzing in detail the impact of the investment structure on environmental and economic processes with the adaptation for international report.

Various functions were used for time series calculations. Sometimes they were quite complex, but more often simple two-factor or three-factor multiplicative functions, which allow considering the possibility of compensating one factor for another, were used:

$$E(t) = A(t) \times X_1^{\mu}(t) \times X_2^{-\eta}(t), \quad (2)$$

$$E(t) = A(t) \times X_1^{\mu}(t) \times X_2^{-\eta}(t) \times X_3^{\nu}(t), \quad (3)$$

where $E(t)$ – studied environmental indicator (emissions of pollutants into the atmosphere, concentration of pollutants, ratio of atmospheric emissions to GDP, and other indicators);

$X_1(t)$ – a factor that reflects economic growth and, as a rule, negatively affects the environment (investments in a new construction, GDP, GRP, fixed assets, and other indicators);

$X_2(t)$ – a factor that reflects environmental protection activities and has a positive impact on the environment (investments in air protection, current costs of air protection, its amount, and other indicators);

$X_3(t)$ – a factor that reflects the development of the economy, which can have a positive or negative impact on the environment, depending on the environmental and economic policy (investments in the economic modernization, the index of structural shifts in the economy, and other indicators);

$A(t)$ – neutral environmental progress, usually an exponent with parameter p (the reduction of pollution levels at the expense of factors which were not taken into account in the equation, structural shifts first of all);

m, h, v – constant parameters (factor elasticity);

t – year.

Calculations were based on standard packages using the method of least squares.

The introduction of a neutral environmental progress $A(t)$ is required for better accounting of structural shifts and sectoral modernization in the absence of detailed information on sectors. If it is available, it is easy to estimate the rate of neutral environmental progress p, highlighting the impact of the modernization in sectors and structural shifts according to previously derived formulas [37; 38].

The difference between collected statistical information in the Russian Federation and the EU led to the necessity to develop a separate methodology for constructing pollution functions for the EU. There are indicators in Russian statistics that reflect investments in the modernization of enterprises, but they are not

available in the EU. Therefore, the approach, based on changes of the investment structure and dynamics of investments into machinery and equipment, was used to assess the impact of the economic modernization. The technological level was linked to the dynamics of labor productivity and other indicators of sectors that contributed the most to the total volume of pollution. To assess the impact of structural shifts, the approach based on changes of the ratio of sectors with the highest and lowest environmental impact or the share of the sector with the highest level of pollution was proposed.

The choice of the type of dependency was determined by a preliminary data analysis and the construction of graphics, which allowed us to identify existing connections between indicators or their characteristics, such as growth rates. We analyzed the presence of lagging changes of indicators and studied smoothed data. The choice of factors also depended on the availability of data and the opportunity to get quite long time series. Cumulative investments over the last 3–6 years were used for calculations, which facilitated the usage of pollution functions for forecasting.

Constructed functions allow investigating changes of environmental indicators under different economic policies in the process of evaluating the dynamics of the production output, based on production functions under different scenarios. It also possible to assess the impact of changes of the environmental policy by setting different dynamics of environmental investments and environmental expenditures on nature protection activities. Based on the experience of countries with existing BAT-based laws, the dynamics of environmental expenditures and investments in the production modernization may be linked to changes of environmental legislation in the Russian Federation. For this purpose, data for the EU and Finland were studied.

The analysis of environmental and economic processes showed that current trends sometimes change rapidly under the influence of external shocks, the connection of pollution with some indicators remains stable, and it changes significantly with others. In this case, it is advisable to use a spline function that is a continuous one, but it has a gap of the first derivative.

Two approaches were used. The first one underlined the year of the change of environmental legislation and analyzed the graphs of indicators and their inter-connections. If there was the fracture of existing trends or the transformation of the interconnection between indicators within a few years after the change of legislation, two periods were distinguished, and the spline function was calculated. The second approach was used to construct graphs of interconnections between indicators and the dynamics of their ratios. The analysis revealed the year when current trends changed, two periods were identified, and calculations of the spline function were performed. If parameters obtained over different periods differed slightly, then the function (3) was constructed instead of the spline function (4).

For calculations, studied indicators were divided into two rows (in the first period, values of the second row are equal to one, in the second one – values of the first row are equal to one). While selecting two periods, each of them can have its own parameters, and, instead of function (3), calculations were performed using the following function:

$$E(t) = A_1 \times A_2 \times X_{11}^{\mu_1}(t) \times X_{12}^{\mu_2}(t) \times \cdot \times X_{21}^{-\eta_1}(t) \times X_{22}^{-\eta_2}(t) \times X_{31}^{\nu_1}(t) \times X_{32}^{\nu_2}(t) \times X_4^{\lambda}(t), \quad (4)$$

where A_1, $X_{11}(t)$, $X_{21}(t)$, $X_{31}(t)$ are equal to one in the second period;

A_2, $X_{12}(t)$, $X_{22}(t)$, $X_{32}(t)$ are equal to one in the first period;

$X_4(t)$ – indicator showing structural shifts.

Some calculations were performed using an incomplete formula. For example, the indicator A_2 was always equal to one, or obtained parameters for one of indicators were close, and, for it, not two rows were reviewed, but one common, and, accordingly, only one parameter was obtained.

For calculations, we collected data for the Russian Federation, its regions, the EU, and Finland for 1990–2017, which allowed building and analyzing graphs of indicators and identifying their dependencies. To analyze changes of the environment's state, we used data for the following key indicators: greenhouse gas emissions, general and substances' individual emissions of pollutants into the atmosphere, the number of population, the level of urbanization, the share of industry in GDP (GRP), the share of services in GDP (GRP), the level of electricity consumption, the volume of exports, the dynamics of main economic sectors, investments in machinery and equipment, etc.

Calculations' data for the Russian Federation and its regions were taken from the FSSS[1] website and statistical reference books[2], data for EU calculations – from the official website of the Eurostat[3], and for Finland – from the Statistics Finland website[4].

Since collected indicators vary in countries, environmental indicators, available in international statistics, were chosen for comparison whenever possible. It should be noted that methodologies change, and comparable series of some data are not given in reference books. In this case, they were recalculated using the information available on websites.

We collected information about changes of environmental legislation in the Russian Federation, the EU, Finland and analyzed information on environmental activities. On its basis, periods, in which the parameters of functions (2) – (4) should have been stable, were distinguished, and the influence of economic crises was reviewed. As a result, spline functions were built in order to consider the role of external shocks.

Results of the research and its analysis

Environmental legislation of European countries was constantly improved and tightened. In the EU, in 1975–1984, there was the introduction of directives to fight air and water pollution, to management wastes. Later, it was clarified and supplemented. In 1996, the UE Council Directive 96/61/EC, concerning integrated pollution prevention and control, was adopted[5]. Unlike the first directives, aimed at controlling pollution, it was introduced to prevent pollution, and it regulated the usage of BAT. The Directive was supplemented in 2000 and 2004. It was replaced with a new Directive in 2010 – Directive 2010/75/EU of the European Parliament and of the Council "On industrial emissions"[6], which was also supplemented and clarified in 2012. The EU members' legislation changed in accordance with directives, but with some lags.

The first Environmental action program was adopted in the EU in 1973. It focused on protecting and reducing atmospheric pollution. For the first time, the need to apply environmental taxes was stated. Since 1993, the fifth program, aimed at achieving the sustainable development goals, was active, the

[1] *FSSS.* Available at: http://www.gks.ru (accessed 11.01.2019).

[2] *Protection of the environment in Russia. 2018: Statistics Collection.* Rosstat. Moscow, 2018. 125 p.

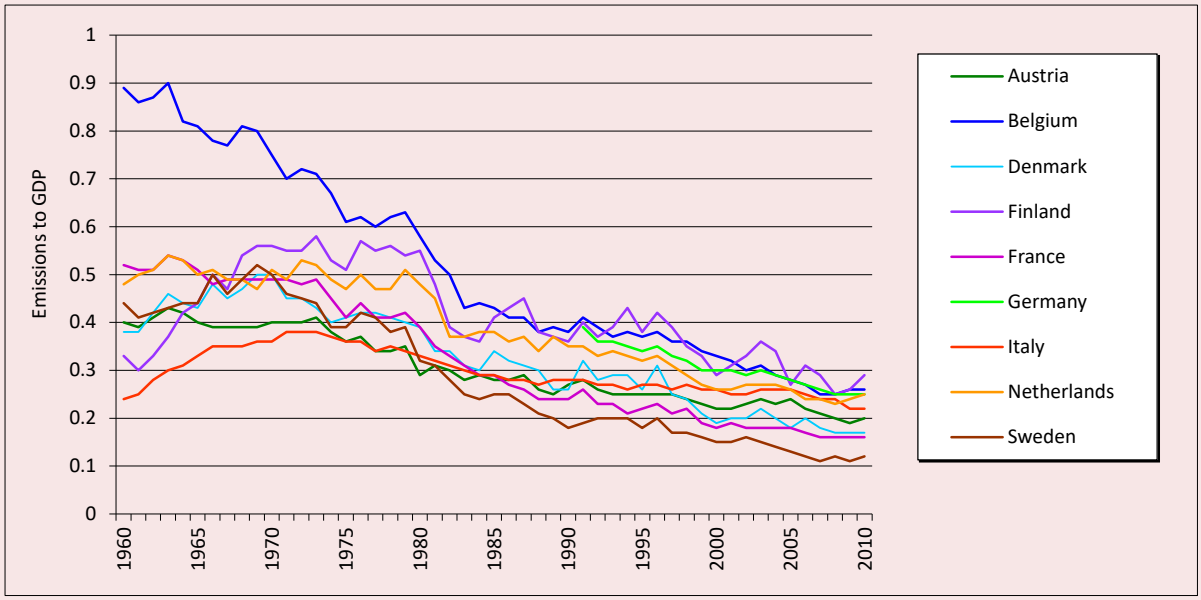
[3] *Eurostat.* Available at: http://ec.europa.eu/eurostat/data/database (accessed 11.01.2019).

[4] *Statistics Finland website.* Available at: info@tilastokeskus.fi. (accessed 11.01.2019).

[5] *Council Directive 96/61/EC of 24 September 1996, concerning integrated pollution prevention and control.* Available at: https://eur-lex.europa.eu/eli/dir/1996/61/oj

[6] *Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control).* Available at: http://data.europa.eu/eli/dir/2010/75/oj

Figure 1. Dynamics of the ratio of CO_2 emissions to EU countries' GDP, million tons / billion euros



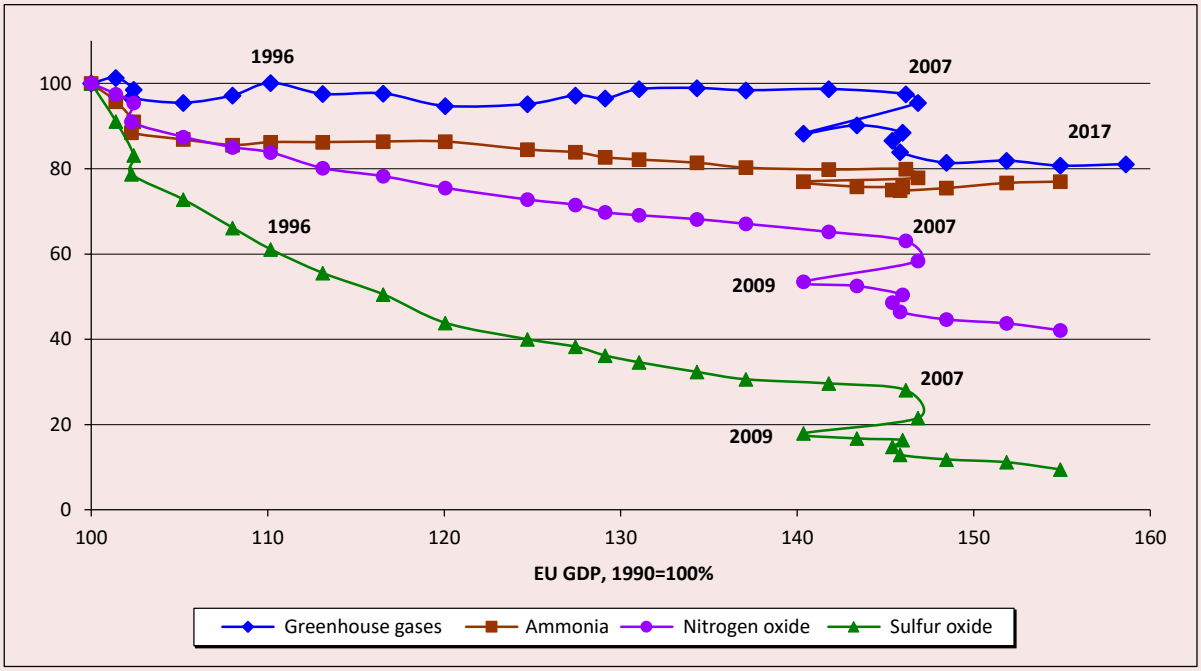
sixth one was adopted in 2002, and the seventh program has been in operation since 2013. Each of them set new environmental goals, defined strategic approaches to its solution, and new legislative initiatives.

In the middle of the 1990s, the share of environmental taxes in the EU GDP exceeded 2%, and, in the Nordic countries, it was significantly higher: in Finland – 2.5%, Sweden – 3.2%, Norway – 4.9%. In recent years, environmental taxes in the EU accounted for 2.5% of GDP, these are primarily energy taxes. In some countries, taxes are reducing at the expense of using renewable energy sources.

If we look at the period until 1990, most EU countries' emissions of pollutants had been increasing until the mid-1970s – even faster than the growth of their economies. Later, the growth began to slow down, and, since the 1980s, for certain types of pollution, the volume of emissions began to decrease with the growth of the economy (*Fig. 1*). The implementation of the first program in the 1970s led to significant changes in the EU environmental policy: foundations of a real policy were formed, goals, principles, priorities, and measures, which needed to be implemented, were defined. In fact, the period of 1960–1990 is described by the KEC for some countries. The tightening of the environmental policy led to the change of technologies and contributed to the intensification of structural shifts in the economy.

The detailed analysis of data since 1990 shows that almost all types of emissions have positive trends. In other words, if the economy grows, the amount of pollutants' emissions decreased (*Fig. 2*). After the adoption of the 1996 defining directive, the dependence of emissions on the dynamics of GDP did not exactly change. Trends continued until 2007. Only greenhouse gas emissions decreased a little bit, but later they achieved previous levels. In 2008, the economic crisis began. It broke existing trends, and the productions decreased, approximately, by 5%; emissions decreased too. In 2014, GDP of the EU exceeded 2007–2008 levels, and the level of pollution was noticeably higher. The production in crisis times was "greener". It needs to be mentioned that, since

Figure 2. Dependence of pollutants' emissions into atmosphere (1990 – 100%) on the dynamics of the EU GDP (1990 – 100%)



2010, 1990–2007 trends basically continued, but the level of pollution was lower. Once again, greenhouse gases are exceptions: since 2010, their emissions noticeably decreased. It means that it is possible to construct spline functions using two *A* parameters for different periods without changing other indicators.

If we review the dynamics of the ratio between the pollution volume and the EU GDP, it is noticeable that, after the adoption of the 1996 Directive, rates of its decrease did not accelerate. Instead, since 2000, the slowdown of positive trends has been going on (*Fig. 3*). The 2008–2009 economic crisis led to insignificant changes in the existing situation. We may note certain decrease of greenhouse gases' emissions after the adoption of 1996 and 2010 Directives. The analysis with the usage of spline functions did not reveal significant changes of parameters in 1996–2007.

According to the EU data, dependences of emissions on aforementioned factors were constructed using models (3) and (4). Fairly good statistical characteristics were obtained for all three approaches – general calculations for 1993–2016, calculations of spline functions with the allocation of different *A* indicators for two periods, and calculations of spline functions, shown in *table 1,* with the allocation of two periods for all indicators. All equations are significant, *p* is less than 0.000001. It can be used to predict environmental and economic processes, but more reliable results are obtained when the ratio of emissions to GDP is used as a dependent variable.

For sulfur and nitrogen oxides, cumulative investments in the economy in the second period reflected the negative impact of the economic growth, cumulative investments in machinery and equipment reduced emissions in both periods, and overall environmental protection expenditures had a significant positive impact in the second period. The difference for greenhouse gases is that

Figure 3. Dynamics of the relation of polluting substances' emissions to the EU GDP (1990 – 100%)

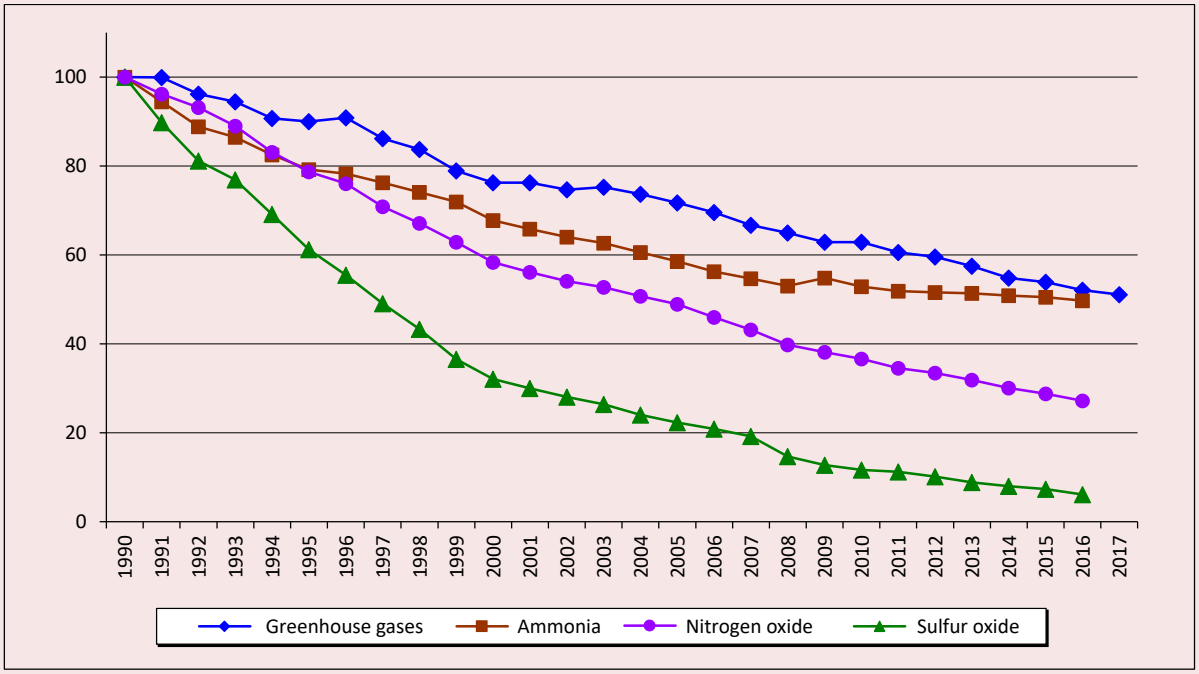


Table 1. Results of calculations of parameters of functions (4) for emissions of pollutants in the EU

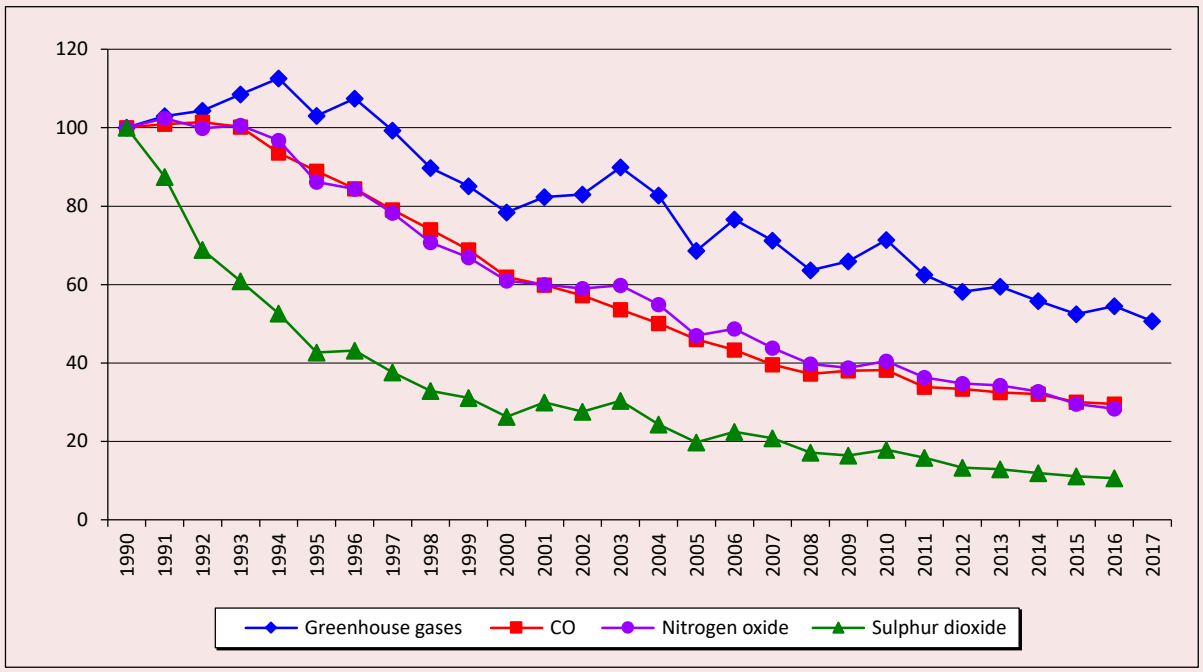
Pollutant	m_1	m_2	h_1	h_2	v_1	v_2	λ	lnA	R^2
Greenhouse gases	1.28*	2.78*	0	0.86*	-0.93*	-2.12*	0.89*	2.96	0.988
Ammonia	0.19*		0.44*	0	0	0	0.51**	4.1	0.957
Nitrogen oxides	0	13.8*	0	4.34*	-1.69*	-11.1*	0	11.17	0.994
Sulfur oxide	0	5.43*	0	1.85*	-0.57*	-4.13*	0	6.83	0.990
* p<0.01, ** p<0.05									

cumulative investments in the economy had a significant impact in the first period. Structural shifts, which were reflected by the share of industry in GDP, were also important. For ammonia emissions, cumulative investments in the economy, total expenditures on environmental protection in the first period, and the share of industry in GDP were significant. Calculations showed that there were no other changes in current trends, except for 2008, when the economic crisis began.

In Finland, after joining the EU in 1996, the Law on nature protection was adopted, which entered into force on 1 January 1997, and it is still active today. Based on the EU Directive of 1996, Finland amended its current legislation in 2000. In 2014, the legislation was amended in accordance with the 2008 and 2010 EU Directives. Finland joined the EU in 1995, when the fifth environmental action program "Towards sustainability" was implemented in the EU, and the EU adopted the concept of the sustainable development. Finland has consistently tightened environmental requirements in accordance with the EU decisions [39].

When Finland recovered from the 1991–1993 crisis, caused by the loss of the "eastern" market due to the collapse of the USSR, emissions of pollutants slowly decreased with the growth of GDP. The ratio of emissions to GDP continuously decreased, except for the early 2000s (*Fig. 4*). Only the amount of

Figure 4. Dynamics of the ratio of air pollutants to Finland's GDP (1990 – 100%)



greenhouse gas emissions noticeably fluctuated due to unexplained spikes of CO_2 emissions in, for example, 2005. In 2004 and 2006, its levels were almost equal. It should be noted that the period since 1994 is well described by the exponential function for most types of pollution.

In dynamics, relations of pollutants' emissions to GDP and legislative changes had a weak impact. Noticeable increase was not shown, only its decrease in 2001–2003 might be noticed. At the same time, despite 2008–2009 economic crisis, the improvement of the environmental situation continued, the ratio of emissions and GDP decreased and continued existing trends.

The dependence of polluting emissions on GDP is much more complicated due to the 2008 economic crisis (*Fig. 5*). Since 1994, emissions have been slightly decreasing with the GDP growth, but, in 2001–2003, the economic growth slowed, and most types of emissions increased slightly. There may have been problems with the transition to BAT in accordance with the EU Directive of 1996. The 2008 crisis led to a long-term stagnation of the Finnish economy; the pre-crisis level of GDP was exceeded only in 2018. At the same time, structural shifts and investments in the economy have contributed to the continued reduction of polluting emissions. In fact, there are two periods – 1994–2008 and 2008–2017 – with distinctly different dependencies.

Calculations were made for emissions of major pollutants (general for 1994–2017 and spline functions) and for the ratio of emissions to GDP. All obtained equations are significant, p is less than 0.000001. *Table 2* shows calculations' results for spline functions (4). Calculations according to spline functions significantly improve statistical characteristics of functions (3). It should be noted that, if a part of function parameters did not change in two periods for the EU and Russia, for Finland, the difference was significant, the impact of environmental investments in the first period

Figure 5. Dependence of atmospheric emissions of pollutants (1990 – 100%) on Finland's GDP (1990 – 100%)

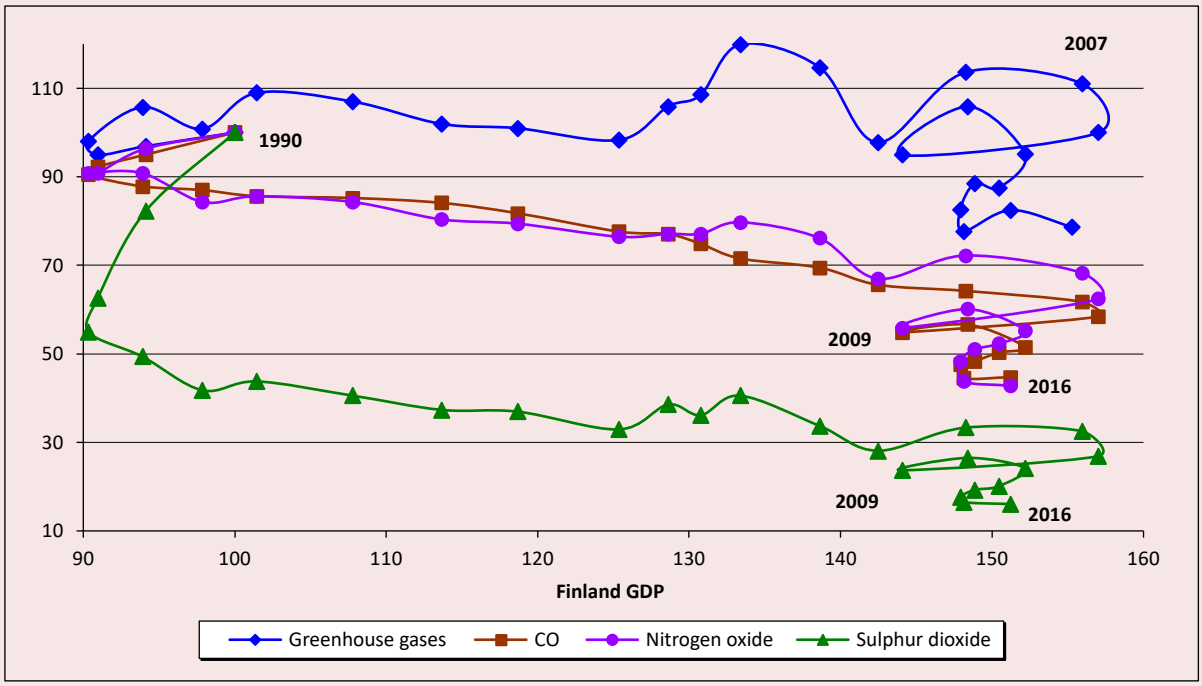


Table 2. Results of calculations of parameters of functions (4) for emissions of pollutants in Finland

Pollutant	m_1	m_2	h_1	h_2	v_1	v_2	lnA_1	lnA_2	R^2
Greenhouse gases	0.124**	0.456*	0	0.463*	0	0	4.07		0.80
CO	1.518*	0.666*	0	0.481*	-0.810*	0	2.96		0.97
Sulfur oxide	1.894*	0	0	1.342*	0	0	-2.64	9.18	0.93
Nitrogen oxide	0.979*	0.801*	0	0.536*	-0.185*	0	1.93		0.96
* p<0.01. ** p<0.1									

turned out to be insignificant, and, in the second, it significantly influenced the reduction of all emissions.

For greenhouse gases, in the first period, only the impact of GDP was significant, and, in the second – industry and environmental investments' impact. For carbon monoxide, sulfur oxides, and nitrogen, in the first period, the impact of changes in the share of industry in GDP was significant, for carbon monoxide and nitrogen oxides, the growth of investments in machinery and equipment had a positive impact, and, in the second period, the dynamics of pollution was determined by changes of industrial production and environmental investments.

The law "On Nature Protection in the RSFSR" was adopted in 1960, the current legislation was formed in 1988–1991, and it was clarified in the future. In 1994, 1996, 1997, and 2000, Presidential Decrees on certain areas of environmental policy were issued. In 1999, the law "On the Protection of the Atmospheric Air" was adopted, and, in 2002, the law "On Environmental Protection", which had a clarifying nature, was also adopted.

In the 1990s, there was a state program for environmental safety and almost 30 programs for solving certain environmental problems. In 1998, The National Environmental Action Plan for the Russian Federation was adopted; in 2002, "Ecological Doctrine of the Russian

Federation" was approved, and the federal target program "Ecology and Natural Resources of Russia for 2002–2010" began to operate. Now, the state program "Environmental Protection" for 2012–2020 is relevant.

The most noticeable changes occurred in 2014, when the law "On Amendments to the Federal Law "On Environmental Protection" and Certain Legislative Acts of the Russian Federation" was adopted, which determined the transition to the introduction of a system of economic incentives for the implementation of BAT. It may significantly affect environmental and economic processes in the future, and, in the meantime, starting in 2019, 300 enterprises, which are main pollutants, will report according to BAT criteria.

The analysis of graphs shows that, after the recession in the 1990s, with the growth of the economy after 1999, emissions of most pollutants began to grow, but the process was slower than GDP growth (*Fig. 6*). We may distinguish three periods: before 1999, from 1999 to 2008, when the ratio of pollution to GDP of the Russian Federation was rapidly declining, and from 2009. They are separated by economic crises of 1998 and 2008–2009. There was no positive impact of new laws and other documents, adopted in 2002 and 2006.

The dependence of emissions on the dynamics of Russian GDP is more complex. It should also be noted that the second and third periods do not differ much (*Fig. 7*).

For the Russian Federation, there is an additional information on investments into the modernization. The first period was not reviewed; calculations were made for the second (1998–2007) and third (2008–2017) periods and for 1998–2017 in general. Calculations for spline functions (4) significantly improve statistical characteristics in relation to functions (3); all obtained equations are significant; p is less than 0.000001 (*Tab. 3*). For the Russian Federation, changes of the economic policy were significant. It was associated with the beginning of the economic growth in 1999 and the 2008–2009 crisis.

Figure 6. Dynamics of the ratio of polluting substances' emissions to GDP of the Russian Federation (1992 – 100%)

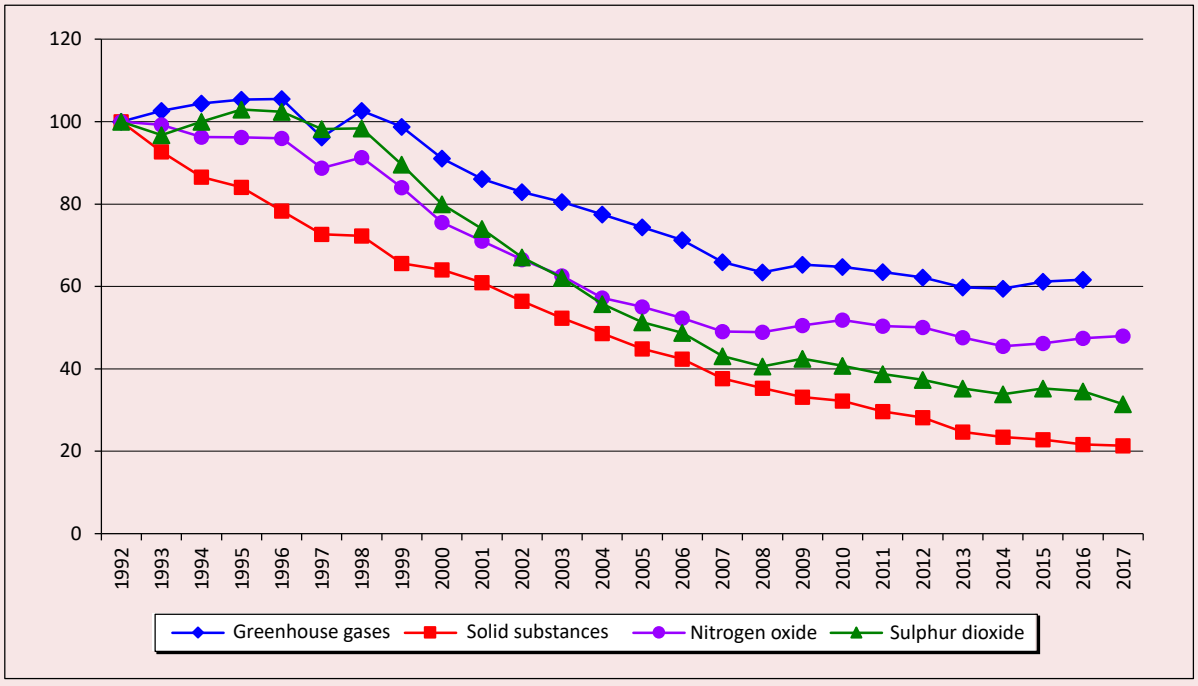


Figure 7. The dependence of atmospheric emissions of pollutants (1992 – 100%) on GDP of the Russian Federation (1992 – 100%)

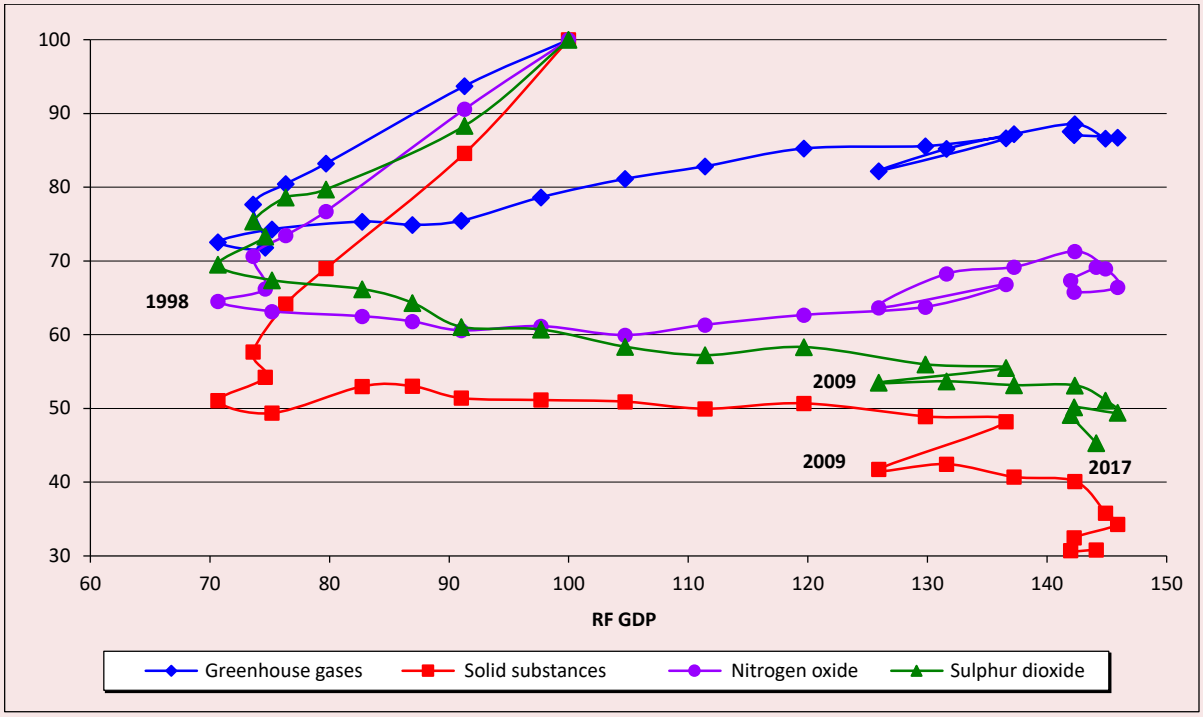


Table 3. Results of calculations of parameters of functions (5) for emissions of pollutants in the Russian Federation

Pollutant	m_2	m_3	h_2	h_3	v_2	v_3	lnA_2	lnA_3	R^2
Greenhouse gases	0.857*		0.162***	0	-0.239*	-0.108*	0.61	1.89	0.910
Solid particles	0.177***	0	0	0.869*	-0.172***	0	4.77	8.13	0.905
Sulphur dioxide	0	1.004*	0	0.51*	-0.144*	0	5.30	2.28	0.945
Nitrogen oxide	0.412*	0.524*	0.198*		-0.214**	0	5.03	2.89	0.911
* p<0.01. ** p<0.05. *** p<0.1									

For greenhouse gas emissions in the second period, the growth of cumulative investments in air modernization and protection partially offset the impact of GDP growth, and, in the third period, the impact of investments in air protection became insignificant. For solid particles atmospheric emissions in the second period, the impact of investments in modernization was the most significant (its growth stabilized emissions by three times), and, in the third period, the growth of investments in air protection contributed to a sharp decrease of emissions. For sulfur dioxide, the decrease of emissions in the second period is associated with the increase of investments in the machinery and equipment, and, in the third – investments in air protection with a significant negative impact of investments in new constructions. In the second period, the decrease of nitrogen oxide emissions gradually turns into the growth, which is associated with the increase of investments in new constructions and fluctuations of investments in air protection. In the third period, the increase of emissions continued for some time. It was going on until investments in air protection began to grow with the small GDP increase.

Since the end of the 1990s, investments in the Russian economy and the share of investments in economic modernization have increased rapidly. New enterprises were built on the basis of modern technologies, the structure of the economy shifted towards the service sector, which helped to reduce the impact on the environment.

Calculations showed that the interconnection between economic and environmental indicators changed significantly during economic crises. It indicates that obtained dependencies may only be used for short-term forecasts. Better results were obtained when the ratio of emissions to GDP was used as a dependent variable. Calculations, based on data from Karelia and other regions, also showed that changes in the interconnection between economic and environmental indicators occurred during economic crises.

Conclusions

The conducted research allowed explaining reasons of worsening environmental indicators with the economic growth, revealing factors that lead to the improvement of the environment, and quantitatively assessing their influence. The most important were investments in modernization of the Russian Federation and the growth of investments in the machinery and equipment of the EU countries, which is also associated with active economic modernization. In the Russian Federation, structural shifts had a great impact, because the development of the Russian economy in the 21st century was carried out on a new technological basis, and the share of new sectors of the economy increased. As the result, the rapid growth of the economy in the 2000s occurred with a slight decrease of environmental pollution, and the economic downturn after 2010 was accompanied by an even greater decrease of certain types of pollution – carbon monoxide and solid substances in particular.

It should also be noted that the dynamics of environmental indicators in the Russian Federation, the EU, and Finland are similar, although the level of pollution per GDP unit is quite different. Factors that determine the dynamics of pollution are the same in most cases, but the degree of their influence is different.

Since global warming is considered to be the most important issue for the EU, the changes in EU legislation were primarily aimed at reducing greenhouse gas emissions. Even though greenhouse gas emissions decreased less than emissions of other substances, it was possible to avoid its growth.

The analysis of data for the Russian Federation showed that most air pollutants were mainly affected by changes of economic policy. Environmental legislation in the Russian Federation has not transformed much, and the implementation of decisions that could significantly affect activities of enterprises was postponed.

Studies show that changes of legislation in the EU did not lead to a sharp change of existing interconnections between economic and environmental indicators, and this influ-ence is not instantaneous, it stretches over several years. After the analysis, we can say that the transition to new legislation in the Russian Federation will be gradual, standards will slowly tighten, and trends of the inter-crisis period will retain. It is possible to predict the interconnection between economic and environmental indicators on the basis of proposed models.

Sharp and rapid changes of existing trends are associated with economic crises, which may lead to the emergence of a new trend or to put the system out of balance for a few years, and then its development will again be described by equations similar to pre-crisis ones.

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Implementing Active Aging in the Labor Sphere (Case Study of the Republic of Komi)*

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Abstract. The goal of this paper is to investigate issues related to active aging and resource potential of the older population in the labor sphere: we assess the level and nature of employment of working pensioners and daily engagement of the unemployed in the conditions of reforming the Russian pension system. This topic is relevant due to Russia's transition to the Western model of aging and the adoption of a law on raising the retirement age. The sources of information include official statistics and the findings of the sociological research "Problems of the third age" that we conducted in 2013 and 2018. After Russia had suspended the indexation of pensions to working pensioners, it witnessed a sharp decline in employment of old-age pensioners, which led to a decrease in their income level, lower employment potential of people of retirement age and a reduction in the duration of active life. Studies prove that age, education, and the type of locality, as well as gender-specific behavioral strategies in the workplace are among the

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strongest employment determinants for older people. There is a fairly stable employment structure in the older population: more than 70% retain their current job, more than 20% find unskilled jobs that are usually in demand among pensioners. As the age increases, not only does the share of working pensioners decrease, but also the percentage of those employed in the same workplace as before retirement decreases. Age discrimination typical of the Russian external labor market is duplicated by discrimination in the domestic market. The labor potential of older people is not utilized to its fullest extent: the reserve is more than 10%. People under 65 have a predominant desire to continue working, depending on their health status, working conditions, and the severity of the issue of double employment. In the five years that have passed between the surveys, unemployed elderly people became more engaged in activities beyond their home life; nevertheless, they are still mostly focused on their family and household.

Key words: demographic aging, older population, active aging, retirement age, resource potential, labor activity, daily engagement, Komi Republic.

Introduction

In the context of increasing life expectancy in Russia, the process of demographic aging has significantly accelerated, i.e. the proportion of the elderly is increasing. Demographic aging is rightfully recognized as one of the global challenges of our time. At the beginning of the 21st century, Russia adopted the Western model of aging, which is characterized by aging "from above", i.e. a reduction in mortality in older ages, accompanied by a certain increase in the number of children. Since 2005, Russia has experienced an increase not only in the proportion of the population older than working age, but also in its absolute number[1]. In this regard, research on aging, a phenomenon that has various aspects and numerous economic, social and political implications, is becoming increasingly relevant; this requires expanding the range of related studies with an emphasis on recognizing that old age and other ages are equally valuable and that this period of human life has its own advantages [1–7].

In preparation for the Second United Nations World Assembly on Aging, which was held in 2002, the World Health Organization formulated a concept and a strategy for active aging [8]. According to the WHO, active aging is defined as "optimizing opportunities for health, participation and security in order to enhance quality of life as people age". In accordance with this, actions were formulated to preserve and improve the health of older people, involve them in various spheres of public life, including economic life, and create a safe physical, psychological, and social environment for them. The European Union selected three areas of action for the 2012 European Year for Active Ageing and Solidarity between Generations. These areas are employment, participation in society, and independent living [9]. The United Nations Economic Commission for Europe has defined active aging as a situation where people, as they age, continue to be formally employed in the labor market or participate in other unpaid productive activities (caring for family members and volunteering), and live healthy, independent and secure lives [10]. In accordance with this, when monitoring active aging, the Commission considers the following areas: employment (employment levels in different older age groups); participation in the community (volunteering, caring for children and grandchildren, caring for other adults, political participation); independence, health and safety of life (physical activity, access to health care, independent living, economic security,

[1] *Official website of Rosstat.* Available at: http://www.gks.ru/ (accessed 22.11.2019).

physical security); opportunities and favorable conditions for active aging (life expectancy at 55 years, the share of healthy life in life expectancy at 55 years, mental health, use of information and communication technologies, social ties, educational resources) [11].

In Russia, the socio-demographic policy aimed at creating conditions for active aging (maintaining health, physical activity, developing cultural interests, and ensuring conditions for participation in social life) is based on the Strategy for action in the interests of older citizens in the Russian Federation until 2025[2], approved by Government Resolution 164-R dated February 5, 2016. In 2018, in compliance with the May Presidential Decree[3], the national project "Demography" for 2019–2024 was developed; it includes five federal projects and the "Older generation" project. It focuses mainly on the health of the elderly, but the list of targets also includes the indicator "Number of citizens of pre-retirement age who have completed vocational training and additional vocational education". Monitoring the results of the project's regional programs, which include measures to increase the period of active aging and the duration of healthy life, involves assessing not only the health status of citizens older than working age, but also the number of older citizens engaged in physical culture and sports at newly created facilities and the number of those who have undergone retraining and training at specially organized courses, including computer literacy courses[4].

Earlier, when we studied the problems of active longevity implementation, we considered the health of the older population in the context of the goals in the field of life expectancy in Russia [12]. Using the example of the Komi Republic, we assessed the dynamics of health status of elderly people in the context of a new wave of medical examination of the adult population in Russia [13]. Along with the development of health care, including specialized medicine, promotion of a healthy lifestyle, formation of a responsible attitude of citizens of all ages toward their health, prevention of the main modifiable risk factors for developing chronic diseases, early detection and adequate treatment of diseases, preservation of health of the older population are inextricably linked with the extension of the duration of a full and active life, which is largely determined by involvement in work [13].

In economically developed countries, quite a large number of scientists are engaged in research on the employment of the third-age population [14–20], since encouraging the employment of older workers, creating conditions for their successful adaptation to the changing requirements of the labor market, and effective use of their professional knowledge and intellectual potential are among the advantages of the Western social model. Russian socio-economic research traditionally considers population aging mainly in the context of its negative economic implications such as an increase in the demographic burden on the working age population, the impact on the labor market and pension systems, and the need to provide social support to the elderly. At present, there are plenty of scientific works devoted to reforming the Russian pension system [21–28]; such works have become highly relevant in conditions of rapid demographic aging. They have become even more popular after a draft law on gradually raising the retirement age in Russia

[2] *Strategy for action in the interests of older citizens in the Russian Federation until 2025*. Available at: http://docs.cntd.ru/document/420334631 (accessed 22.11.2019).

[3] Decree of the President of the Russian Federation no. 204 *"On national goals and strategic objectives of the development of the Russian Federation for the period up to 2024"*, dated 7.05.2018. Available at: http://www.kremlin.ru/acts/news/57425 (accessed 22.11.2019).

[4] *National project "Demography"* (2018). Ministry of Labor and Social Protection of the Russian Federation. Available at: https://rosmintrud.ru/ministry/programms/demography (accessed 22.11.2019).

was submitted for discussion and a federal law on raising the retirement ages to 65 years for men and 60 years for women was adopted[5].

The goal of our present article is to investigate the issues of active aging and implementation of the resource potential of the older population in the labor sphere: we assess the level and nature of employment of working pensioners and daily activities of the unemployed.

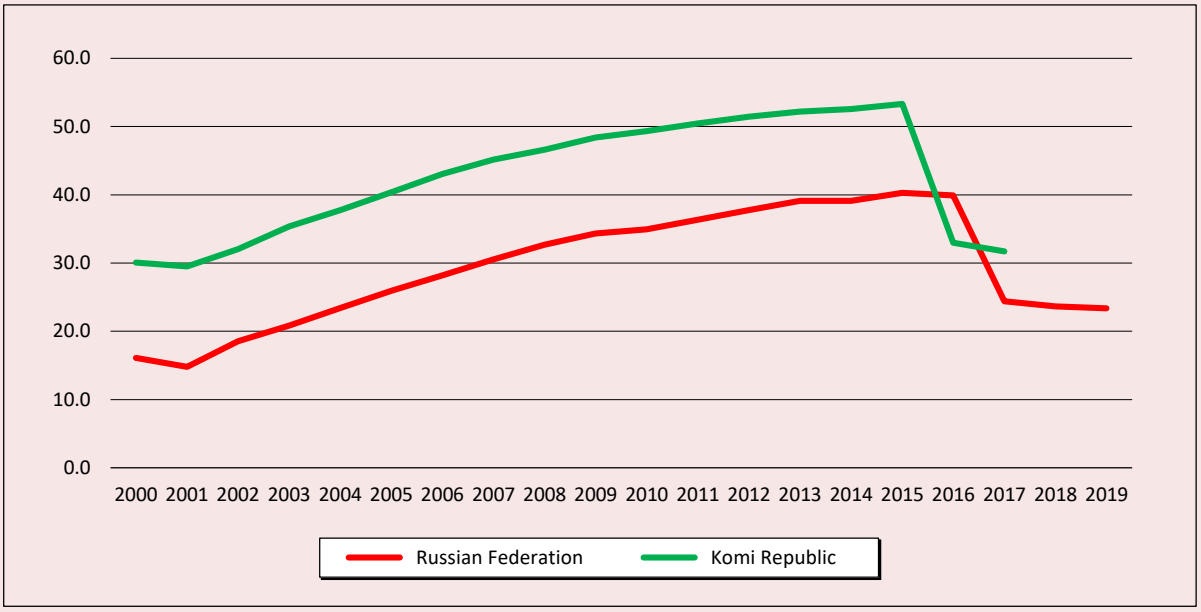
The information base for the study includes official state statistics data and the findings of the sociological study "Problems of the third age" that we conducted on the territory of the Komi Republic in 2018 (1,521 people over 55 years of age were interviewed, the sample is described in detail in [12]). Some questions were analyzed in comparison with the previous similar research (in 2013, 932 people of the specified age were interviewed, the sample and results are described in the monograph [29]). For different sample sizes, the main characteristics (by gender, age, type of settlement, education level, and family status) are almost identical, which makes it possible to compare the results of the two surveys. In addition to the gender distribution, the characteristics of the samples almost fully correspond to the population aged over 55. The marked excess of the share of women (75% of women in both samples compared to 63% in the general population [13]) is explained by the frequent refusal of men to participate in surveys.

Trends in the employment of retirement age population

Active aging is determined by a number of factors. In many ways, it depends on the ability of an individual to continue working after reaching retirement age – if they have the desire to work and do not lack physical abilities. Older people have important and necessary knowledge, social, professional and spiritual potential. Today representatives of the third age remain socially active longer, or at least strive to do so [30]. Researchers believe that employment in old age is caused not only by economic motives and lack of pension provision, but also by being in-demand and being included in social and professional relationships [4]. Specialists in the field of gerontology emphasize the importance and necessity of being employed at an older age. In their view, on the one hand, any form of age discrimination in relation to work should be excluded: age should not be an obstacle to working or studying, if there are no other restrictions to this goal. On the other hand, it is necessary to encourage the elderly themselves by constantly reminding them that the process of individual aging accelerates if there is a sharp decline in physical, intellectual and work load [3]. For example, working people over 55 years of age who participated in the 2018 survey rated their health status at 6.0 points out of 9 against 5.1 points among non-working people. Differences in the subjective assessment of health are particularly significant in working and non-working respondents over 75 years of age. In addition, aging society is characterized by a significant increase in life expectancy, including healthy life expectancy; this increase forms the basis of the so-called "second demographic dividend" at almost all ages. The dividend consists in the ability to use longevity to ensure sustainable social and economic development. Healthy and active aging will extend the period of employment, increase the number of working age population and reduce the demographic burden produced by the elderly [31–33]. In the context of aggravating economic challenges of demographic aging,

[5] Federal Law 350-FZ *"On amendments to certain legislative acts of the Russian Federation concerning the appointment and payment of pensions",* dated 3.10.2018. Available at: http://pensiya.molodaja-semja.ru/wp-content/uploads/2018/10/zakon-o-povyshenii-pensionnogo-vozrasta-ot-03-10-2018-350-fz.pdf (accessed 22.11.2019).

Proportion of employed old-age pensioners in the Russian Federation and the Komi Republic in 2000–2019



Sources: Official website of Rosstat. Available at: http://www.gks.ru/ (accessed 22.11.2019); Statistical Yearbook of the Komi Republic. 2018: Statistics Collection. Komistat. Syktyvkar, 2018.

society should focus on the implementation of the "second demographic dividend", i.e., on the fullest use of the labor potential of the older population.

During the 2000s, the share of working age pensioners in Russia was increasing continuously, reaching almost 40% in 2015–2016 *(Figure)*. In the Komi Republic, the employment rate of pensioners traditionally exceeds the nationwide level, since the age of retirement defined for the Northern territories determines the presence of a significant proportion of young pensioners. In 2011–2015, the share of officially employed pensioners in the region was above 50%. However, as of January 1, 2017, only 24.4% of pensioners were employed in the Russian Federation[6]. Then Komi witnessed a sharp decline in employment: from 53.3% on January 1, 2015 to 33.0% at the beginning of 2016, which was lower than the nationwide level, and to 31.7% at the beginning of 2017[7] (Komistat does not provide data for recent years so far).

This significant reduction in the employment of old-age pensioners is due to the adoption of Federal Law 385-FZ[8] dated December 29, 2015, which suspended the indexation of pensions for working pensioners. Consequently, at least one third of pensioners employed in the economy received certain income from their work, which is in a certain way comparable to the losses in the amount of their pension, including prospective ones, due to the termination of its indexation. In the Northern regions, where pensions

[6] *Official website of Rosstat*. Available at: http://www.gks.ru/ (accessed 22.11.2019).

[7] *Statistical Yearbook of the Komi Republic. 2018: Statistics Collection*. Komistat. Syktyvkar, 2018.

[8] Federal Law 385-FZ *"On suspending certain provisions of legislative acts of the Russian Federation, on amending certain legislative acts of the Russian Federation and on the features of increasing the insurance pension, the fixed payment to the insurance pension and social pensions"*, dated 29.12.2015. Available at: http://base.garant.ru/71294564/ (accessed 22.11.2019).

are higher than the nationwide level (in the Komi Republic, the average age pension in 2015–2016 was 16.3–16.7 thousand rubles[9] in comparison with an average of 11.6–12.8 thousand rubles in Russia as a whole[10]), and their indexation accumulates from younger ages and, accordingly, is more noticeable at the psychological level, officially working pensioners reacted faster to the suspension of indexation. Some of them "withdrew into the shadows", i.e. they continue working, but their employment is now informal. Some were forced to stop working, which not only reduced the level of income and generally reduced the use of the labor potential of people of retirement age, but also contributed to a decrease in the duration of active life of the population.

Features of working activity of the older population

The survey "Problems of the third age" investigates the standard of living and quality of life of the population over 55 years of age, identifies the main problems of older people, their health and social well-being, resources and opportunities. The survey contains a set of questions related to employment. In 2018, the retirement age in the Komi Republic was 50 years for women and 55 years for men, i.e. all respondents were of retirement age. One third of respondents (33.7%) gave an affirmative answer to the question "Do you work at present?" This almost corresponds to the level of official employment of pensioners in recent years and proves that the survey sample is sufficiently close to the general population for this feature; this fact increases the reliability of the analysis of employment-related questions.

Among employed respondents, almost two-thirds (65.9%) are employed full-time at the same place where they had worked before retirement *(Tab. 1)*. Another 7.0% of pensioners work part-time at the same place of employment. Consequently, more than 70% of the economically active participants of the survey (which is almost a quarter of all respondents) remained in their previous jobs; 16.2% are employed full-time at low skilled jobs that are most often taken by pensioners (janitor, caretaker, cleaner, cloakroom attendant, etc.). 6.6% of the employed have unskilled jobs on a part-time basis, 2.5% are owners of their own business. The remaining 1.8% of employed pensioners replied that they work at home, are engaged in network marketing, or work

Table 1. Distribution of answers to the question "If you are employed, then how can you describe your work?"

Answer	Valid % (of the number of the employed – 513 people)	Total % (of the number of survey participants – 1,521 people)
I work full time at the job I had before retirement	65.9	22.2
I work part-time (several days a week) at the job I had before retirement	7.0	2.4
I work full-time at a job that pensioners usually take (janitor, caretaker, cleaner, cloakroom attendant, etc.)	16.2	5.5
I work part-time (several days a week) at a job that pensioners usually take (janitor, caretaker, cleaner, cloakroom attendant, etc.)	6.6	2.2
I work for myself (I have my own business)	2.5	0.9
I am involved in network marketing (distribution of products)	0.4	0.1
I work from home	0.8	0.3
Other	0.6	0.2
Total	***100.0***	***33.7***

[9] *Statistical Yearbook of the Komi Republic. 2018: Statistics Collection.* Komistat. Syktyvkar, 2018.
[10] *Official website of Rosstat.* Available at: http://www.gks.ru/ (accessed 22.11.2019).

full-time within their specialty in another organization, including non-governmental. The distribution of types and forms of employment of people over 55 years of age in 2018 is very close to the distribution we obtained in the 2013 survey [29, p. 45]. Apparently, it is a fairly well-established employment structure of the older population in the region.

As the age increases, the percentage of employed pensioners naturally decreases. Among the participants of the survey aged 55–59, 63.3% are employed; 39.5% are employed among those aged 60–64, 23.4% are employed among those aged 65–69, 8.2% are employed among those aged 70–74, and 5.7% are employed among those aged 75–79. In comparison with 2013, the employment rate of young pensioners has slightly increased and the share of working pensioners over 65 years of age has significantly decreased. Apparently, the sharp decline in the employment of old-age pensioners after the suspension of pension indexation for working pensioners occurred at the expense of older age groups, who already experienced the increase in pension due to annual indexations.

Like in 2013, as people grow older, the proportion of working pensioners decreases; moreover, the percentage of full-time employees among them decreases as well. Over 75% of 55–59-year-old working respondents work full-time at the same place as before retirement, the figure in the 60–64-year-old group is 60%; a little more than half (53.8%) – among those aged 65–69, a little more than a third (35.7%) – among those aged 70–74, and only a third – among people 75–79 years of age. In other words, as their age increases, older people are forced to quit their job. It often happens that when people reach or even approach retirement age, they feel vulnerable in the domestic market of their company despite the fact that they have worked here for quite a long time. At the same time, older people in Russia have low competitiveness in the external labor market. In older working and retirement ages, it is quite difficult to get a new job within one's specialty. Thus, according to the findings of a 2013 survey of managers of organizations and enterprises of various forms of ownership, only half of employers do not set age requirements for job candidates when recruiting employees [34]. In this regard, pensioners often have to comply with simpler forms of employment, sometimes with temporary or partial employment.

Discrimination against older workers in Russia appeared and became more acute during the period of socio-economic reforms in the 1990s, when the labor market in the country was just emerging. A sharp decline in production and a decrease in the number of traditional jobs at state-owned enterprises caused the displacement of pensioners from employment; "new" employers preferred to hire young people. Since the early 1990s, an open form of age discrimination emerged in the Russian labor market: job advertisements in which the main emphasis was placed on the age of the desired employees became widespread [35]. According to research estimates, age discrimination in employment in 2012 was almost twice as high as gender discrimination, although gender discrimination, in contrast to age discrimination, is often the subject of social research or discussion in the public sphere [36]. Amendments that prohibited discrimination in job advertisements were added to Federal Law 1032-1 "On population employment" only in 2013[11]. This has improved the situation to a certain extent; however, hidden discriminatory

[11] Federal Law 162-FZ "On amending the law of the Russian Federation "On employment in the Russian Federation" and certain legislative acts of the Russian Federation", dated 2.07.2013. Available at: http://ivo.garant.ru/#/document/70405682/ (accessed 22.11.2019).

practices still remain, especially concerning high-paying jobs, for which employers prefer to hire 35–40-year-old candidates [37]. The refusal to hire an applicant can be based on any artificially created reason why the candidate is unfit for the position. At the same time, in Russia, it is the potential employee who will have to prove in court the fact of age discrimination when they were refused employment, and the employer is subject to the presumption of innocence, while the approach is fundamentally different in the European Union, the United States and Canada: the employer must prove that the principle of equality was not violated [35].

As in 2013, there is a clear direct correlation between the employment of the population over 55 years of age and the level of education. Forty six percent of respondents with higher education noted one or another type of work activity. Moreover, the vast majority of them (83%) remain at the same workplace as before retirement: 75% work full-time, 8% work part-time. Thirty three percent of pensioners with secondary vocational education have an employment, 72% of them are employed at the same workplace as before retirement: 66% work full-time and 6% work part-time. Twenty percent of the elderly with primary vocational education are employed (only 45% of them are at the same workplace as before retirement); 16% of pensioners without vocational education are employed (41% of them at the same workplace as before retirement). Of course, the dependence of employment on education may be partly due to the fact that pensioners from younger age groups have a higher level of education, but there is also a direct link between these characteristics for certain age groups.

The level of employment of pensioners varies significantly depending on the types of localities. Thirty nine percent of respondents over 55 years of age work in urban areas, 26% in urban-type settlements, and 25% in rural areas. Significant inter-settlement differences are caused not so much by the possibilities to preserve employment as by the difficulty to find a job such as watchman, cleaner, janitor, etc. in small settlement, i.e. the job that pensioners have more chances to get in the city (towns, and rural settlements in the Komi Republic have small population: the average population is about 3.5 thousand people). There are few such jobs in villages and towns, and they are usually occupied by working age people.

Despite the fact that the average age of men in the array of respondents is slightly lower than the average age of women (65 and 66 years, respectively) and their weighted average subjective assessment of their health is slightly higher than that of women (5.5 vs. 5.3 points out of 9) [13], the level of female employment is significantly higher: 35% compared to 29 for men. At the same time, as in 2013, women of retirement age are much more likely to continue working at the same place as before retirement: 75% of women vs. 65% of the surveyed working men over 55 years of age. It is clear that women are more likely to stick to their old job even if they are now paid less due to a part-time work schedule, while men who are determined to continue working after reaching retirement age are more active in looking for a new job in the current labor market or are engaged in their own business; 5.6% of working men over 55 years of age said that they work for themselves; the figure among women is 1.7%.

Reasons for termination of employment at older ages

Almost two-thirds (66.3%) of survey participants are no longer working. Almost all of them (with the exception of two people) answered the question why they are unemployed; some chose several answers. The vast majority (almost 64% of non-working respondents over 55 years of age) said they

Table 2. Distribution of answers to the question "If you are no longer employed, then why?"

Answer	Valid % (of the number of respondents – 1,006 people)
I am retired because I deserve to have a rest	63.7
My age no longer allows me to work	17.1
I can't work due to health issues	17.0
I have a lot of work to do at home, in the garden, at my dacha	5.2
I need to help children raise their grandchildren	4.3
The company (workplace) where I had been employed was shut down (cut)	3.6
I had to leave my job because there is not enough work for young people	3.0
I need to take care of my sick, elderly relatives	1.4
Other	1.1
Total	***116.3***

"worked enough to deserve a rest" as the reason why they are unemployed *(Tab. 2)*. We should note that in 2013, the question concerning motives for termination of employment was open-ended, the respondents formulated their answers on their own (the answer about the right to receive pension provision was the most common among them at that time as well). In 2018, we offered a question in the form of ready-made suggestions. It turned out that reaching the retirement age is quite a sufficient reason for quitting one's job, i.e. a low retirement age does not inspire people to implement active aging strategies. Seventeen percent of non-working pensioners chose the answer "My age no longer allows me to work". Such answers are common among respondents over the age of 75. Seventeen percent of respondents indicated their health status. This answer is most often found in the youngest age group, which indicates that at 55-59 years of age, it is the state of health that plays a significant role in deciding whether to continue working or retire. Young pensioners attach significant importance to the reasons associated with the need to raise grandchildren and care for sick or elderly relatives. Of course, these reasons are more common among women. In rural areas, the need to work at one's private subsidiary plot is quite important. In general, the specified motive ranks fourth in the group of reasons for unemployment in the array. The answer option "I have a lot of work to do at home, in the garden, at my dacha" was noted by 5.2% of all respondents, in rural areas – 9.3%.

Almost 8% of the answers indicate a lack of jobs in one form or another, since almost all the answers in the group "Other" are included in the group. Moreover, the liquidation of an enterprise (workplace) is more of an urban phenomenon, and the answer "I had to leave my job because there is not enough work for the young" applies more to rural areas.

Some information about the attitude of older people toward employment is provided by answers to the question "Would you like to work now, being retired?" *(Tab. 3)*. The question was addressed to all participants in the survey, so among the answer options there was the answer "I have a job". This option was chosen by 20.4% of respondents. We remind that 33.7% of respondents answered affirmatively to the direct question "Are you currently employed?" Almost three-quarters of those who answered "I have a job" (74%) are employed at the same workplace as before retirement (67% work full-time, 7% work part-time), 17% work full-time and have an unskilled job. Thus, as in 2013, pensioners consider full-fledged employment as employment at same workplace as before retirement and as a full-

Table 3. Distribution of answers to the question "Now that you are retired, would you like to work more?"

Answer	Total % (of the number of survey participants – 1,521 people)
Yes	24.9
No	54.6
I work	20.4
No answer	0.1
Total	***100.0***

time job that does not require high skills. Other income-generating activity is assessed as temporary and situational, and as the activity that people are forced to do due only to economic motives, need, and insufficient pensions. This activity is not satisfying and is less likely to prolong life expectancy in the older population.

An affirmative answer to the question "Would you like to work more now that you are retired?" was given by 24.9% of respondents. We note that 53.4% of them (13.3% of all respondents) were employed at the time of the survey. Obviously, they are not satisfied with their work and are ready to change it; 46.6% (11.6% of all respondents, a value almost identical to the one obtained in 2013 – 11.2% [29, p. 49]) are non-working pensioners who would like to get a job. That is, the reserve of labor potential of retirement age individuals, as in 2013, is more than 10%. Insufficient implementation of the resource potential of the older generations is due to the fact that in the labor sphere, the normative limits of working capacity/disability are determined by the retirement age. The retirement age, which at the time of the survey in the Komi Republic was 50 years for women and 55 years for men, sets benchmarks for determining a "suitable age" standard in the labor market. Moreover, research shows that not only people over working age are at risk of discrimination in the job search situation, but also a significant part of people of standard working age, i.e. about 10–15 years before reaching the retirement and even pre-retirement age threshold [36]. The lower the retirement age, the younger is age discrimination in the labor market and the greater is the reserve of underutilized labor potential of the older population, and the lower is the implementation of active aging strategies.

The majority of respondents (54.6%) gave a negative answer to the question concerning whether they want to work while being retired, i.e. more than half of people over 55 years old believe that they have already earned the right to have a rest. Of course, the prevalence of this answer is very closely related to age. At the age of 55–59, only slightly more than 25% of respondents prefer not to work anymore, at the age of 60–64 – 43%, at 65–69 – 64%, at 70–74 – almost 80%, among people over 75 years of age – from 85 to 100%. Thus, as in 2013, the desire to continue working prevails until about 65 years of age, and in older ages, most of the respondents prefer a well-deserved rest.

The lack of desire to continue working after reaching the retirement age has an inverse relationship with the level of education. Forty eight percent of respondents with higher education, 54% of those with secondary vocational education, 64% with primary professional education, and 70% without professional education said they no longer wanted to work. The desire to take a break from work at the retirement age is more common among men, but the difference is statistically insignificant (56% vs. 54 for women), as well as in small localities (59% in rural areas and 62% in urban settlements vs. 52% in cities), which may be due to more difficult working

conditions and engagement of residents of villages and settlements in household and non-commodity agricultural production. In other words, the desire to continue working after reaching the retirement age depends not only on age and good health, but also on the working conditions and the availability of sufficient free time to avoid double workload.

Daily engagement of non-working pensioners

Non-working elderly people were asked a question "If you are not working, how can you describe your engagement?" There could be several answers to the question. As in 2013 [29, p. 51], the most common answers were as follows: "I work at my private subsidiary plot, at my dacha" (43.0% of unemployed participants of the survey) and "I do household chores" (40.5%), which switched places; one more common answer was "I help my children care for my grandchildren" (37.1%; *Tab. 4*); 14.6% of non-working elderly people answered: "I do various crafts, sew, knit, do embroidery, etc.". Given that the question suggested alternative answers, it can be concluded that at least 43% of non-working pensioners are very active in household management.

It is noteworthy that the percentage of unemployed older people engaged in community work has increased significantly, almost twice, as compared to the results of the 2013 survey: 15.6% compared to 8.3% in 2013. In this regard, the corresponding answer rose to the fourth position; 4.7% of the elderly write poems, memoirs, draw, and engage in other creative activities at their leisure (compared to 2.7% in 2013); 2.0% of officially unemployed older people note that they occasionally work within their specialty as before retirement; 4.8% of non-working pensioners wrote answers in the section "Other". In contrast to the 2013 survey, when they were mainly related to household chores, the answers in 2018 mostly concern active, sport, creative and charitable activities; 9.1% of unemployed did not describe their engagement in any way.

In general, we can note that in the five years between the surveys, non-working people over the age of 55 have become more active outside their homes. However, family and household are still important to them. Before reaching 75, at least 35% of them not only do household chores, but also work at their dachas and private subsidiary plots, and more than one third of respondents help their children take care of their grandchildren. These types of engagement do not correlate with education; however, people with higher and secondary vocational education were more active in community work and in creative activities. In general, women answered this question more actively, so they are ahead of men in almost all types of daily engagement: in household and dacha, in helping their children

Table 4. Distribution of answers to the question "If you are not employed, please describe your engagement?"

Answer	Valid % (of the number of unemployed pensioners: 1,008 people)
I work in the garden, at my dacha	43.0
I do household chores	40.5
I help my children take care of my grandchildren	37.1
I do community work	15.6
I do various crafts, sew, knit, do embroidery, etc.	14.6
I am engaged in creative work (I write poems, memoirs, draw, etc.)	4.7
From time to time I work part-time within my specialty	2.0
Other	4.8
No answer	9.1
Total	***165.8***

take care of their grandchildren, in community work, in creativity, and in various kinds of crafts. Compared to women, unemployed older men are more likely to work part-time in their previous profession and to play sports. Elderly non-working rural residents have shown themselves to be very proactive. Among them, as well as among women, the number of those who did not answer the question about employment is considerably smaller. They are active not only in doing household chores and gardening, but also in helping to care for their grandchildren, in social activities, handicrafts and creativity.

Conclusions

Thus, after the suspension of pension indexation for working pensioners in Russia, there was a sharp reduction in the employment of old-age pensioners; this fact not only reduced their income level and reduced the use of the labor potential of people of retirement age, but also contributed to a reduction in the duration of an active healthy life. In the Northern regions, where the pension size is higher and its indexation occurs at younger ages, officially working pensioners have reacted faster to the suspension of indexation. Sociological surveys of the population over 55 years of age, conducted in 2013 and 2018, showed that age, level of education and type of locality are the most significant determinants for the labor activity of older people; there are also gender-specific behavioral strategies in the labor sphere. The structure of employment in older ages is quite well-established: over 70% work in their previous jobs as before retirement, more than 20% are engaged in unskilled work in the areas a pensioner can usually get a job. At the same time, the share of working pensioners decreases as their age increases, and the percentage of those employed in their previous jobs decreases: age discrimination typical of the Russian external labor market is duplicated by discrimination in the domestic market. This is largely due to the lack of jobs. The labor potential of older persons is underutilized. According to the results of both surveys, the reserve is more than 10%: more than a tenth of the respondents of retirement age are not employed, but want to work. People under the age of 65 have a predominant desire to continue working, which depends on the state of health, working conditions, as well as the severity of the problem of dual engagement: at work and at home. In the context of increasing economic challenges of demographic aging, society should focus on maximizing the employment potential of the older population in order to obtain a "second demographic dividend". To do this, it is necessary to eliminate all manifestations of age discrimination in the labor sphere. Since the retirement age sets the benchmark in the construction of the "suitable age" standard in the labor market, its increase will help reduce ageism in employment and at least raise the age limit for the beginning of its manifestation, increase the use of the resource potential of the older generation and implement healthy and active aging strategies. The double standards introduced at the end of 2015 in the provision of pensions to working and non-working pensioners should be abolished – on the contrary, it is necessary to support the elderly and encourage and promote their employment. The unemployed elderly have become more active outside their homes in the five years between the surveys, but they are still mostly family-and household-oriented. At present, when population aging is accelerating, the need to improve the conditions for the involvement of all older people in socially useful activities is on the agenda. The primary task is to influence public consciousness purposefully and consistently in order to form a culture of aging and attitude toward the elderly.

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Trends and Prospects in Sociodemographic Dynamics of Russia: Philosophical and Economical Approach*

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Abstract. The study is aimed at analyzing the long-term historical dynamics of sociodemographic processes in Russia over the period of 500 years and elaborating the directions for overcoming the current sociodemographic crisis. The novelty of the research consists of considering cyclic sociodemographic processes with a significant horizon period (half a millennium), and studying the impact of government regulations in the country starting from the "the Time of Troubles", through the reforms of 1861, the revolution of 1917 and the transformation of 1991, on demographic bifurcations. The authors introduce the statistical information regarding the population of Russia from 1500 to the present moment; the researchers propose to use the philosophical and economical approach (the theory of population economy) analyzing

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the population problems based on the theory of economy's philosophy and the theory of economy by S.N. Bulgakov and Yu.M. Osipov, the professors from the Lomonosov Moscow State University; and by 2025 to elaborate and adopt the social doctrine of the Russian Federation. Using the historical material the authors prove that the mechanisms and institutions of state regulation in the country can create conditions affecting the change of the population's reproductive behavior. The article presents the comparative analysis of the proposed theory of "population economy" and traditional ones of economic demography and population economics, and describes the main postulates of the theory of "population economy". The researchers mark the factors that should be taken into account in composing the social doctrine of the Russian Federation. The research results can be used for justifying the long-term strategy of the sociodemographic policy in Russia.

Key words: sociodemographic processes, demographic cycles, social doctrine, sociodemographic complex, population economy.

Introduction

During the 20th century, there was a turn toward the development of a strategy for regulating population reproduction at the state and UN levels. It is especially relevant for countries with depopulation. Russia belongs to this group. Since 2017, it has been going through the stage of depopulation for the second time in the contemporary history. It indicates crisis effects in the socio-economic sphere [1].

In such circumstances, Russian scholars face a task of developing relevant theory of population. Traditionally, these problems are included in the sphere of economic demography and population economy. We suggest complementing these approaches with the study of the organization of population reproduction – ***the theory of population economy***.

During its development, we focused on the following points:

1) description of main provisions of the theory of population economy;

2) cyclical fluctuations of sociodemographic processes, without which it is impossible to adequately regulate it at the state level;

3) overview of the dynamics of the sociodemographic development over the last 500 years considering four bifurcation points[1] ("Time of Troubles", reforms of 1861, revolution of 1917, transformation of 1991) aimed at the application of historical approach to socio-demographic processes which allow considering features of Russia's demographic dynamics and showing that bifurcations in the state socio-economic regulation cause changes of population's reproductive behavior. This position is disputed by several demographers.

The real crisis sociodemographic situation in Russia at the state level should be overcome in 2018–2024 with the help of the implementation of the system of national projects. To ensure the continuity of the state social regulation in Russia, we propose to develop and adopt a Social doctrine of the Russian Federation at the federal law level by 2025. It should reflect the fact that the country, according to the Constitution, is postulated as a social state. Interlinked aims of the Doctrine should be:

1) depopulation overcoming;

2) improvement of the level and quality of life of Russian population;

3) compliance with social security of the Russian Federation [2].

[1] Point of bifurcation – the change of the system's established operation mode.

The social doctrine of the Russian Federation should include a description of mechanisms and institutions of the state regulation of reproduction processes of the country's population, which is the subject of the theory of population economy.

1. The theory of population economy

Economic problems of population are studied by such sciences as economic demography and population economy. Let us consider the difference of these approaches from the proposed theory of population economy.

Economic demography and population economy are based on achievements of political economy, and the theory of population economy is based on the ***theory of economy***[2] developed in 1995–1998 by the professor of the Lomonosov Moscow State University Yu.M. Osipov. They are also different in philosophical basis: the first two approaches are based on economic materialism, and the theory of economy is based on ***philosophy of economy***, which was developed at MSU by S.N. Bulgakov. He also defended it as a doctoral dissertation in 1912 [3] (*Tab. 1*).

Let us review main provisions of the theory of population economy.

1. Population reproduction is simultaneously a family and social reproduction. Social population reproduction appears as an organism in which all families (cells of a body) do not just interact, but they are in a mutual position organized in a certain way. Every family is a system. At the level of families, population reproduction is carried out, at the first glance, spontaneously. At the same time, humanity, as a social organism, is a part of a civilization consisting of states. Within each state, the institution of marriage is legislated.

It will be discussed below how drastic changes of socio-economic conditions in a country affect the natural reproduction of population. Currently, the regulation of these processes is moving to the global level. In UN documents of the 21st century[3], aims of the sustained development, many of which are related to socio-demographic processes, are defined. Until this, in 1961, the European Social Charter – the Convention of the Council of Europe, which secures a number of social human rights (in 2009, the Russian Federation joined it) – was developed and adopted. It impacted socio-demographic processes in Europe. Thus, humanity, as a single social organism, begins to pay attention to the organization of reproduction of the Earth's population.

Table 1. Comparison of population theories

	Economic demography	Population economy	The theory of population economy
Philosophical basis	Economic materialism	Economic materialism	S.N. Bulgakov's philosophy of economy (MSU, 1912)
Scientific basis	Political economy	Political economy	Yu.M. Osipov's theory of economy (MSU named after M.V. Lomonosov, 1995–1998)
Object of research	Population	Population	Population
Subject of research	Influence of demographic processes and structures on the economic development	Influence of economy on demographic processes of population reproduction	The organization of population's reproduction

[2] Osipov Yu.M. *Teorija hozjajstva: ucheb. v 3-h t., tom 1.* Moscow: Izdatel'stvo MSU, 1995. 458 p.

[3] *Transforming our world: The 2030 Agenda for Sustainable Development.* Available at: https://sustainabledevelopment.un.org/post2015/transformingourworld (accessed 18.09.2019).

2. The good, which is the product of the population's reproduction, is a human. The organization of reproduction is a special sphere of a person's activity. The activity according to such organization is ***the economic management***. In population economy, in order to describe economic mechanisms of the population's reproduction at the level of households, the theory of the Nobel laureate Gary Becker [4] is used as the basis. It is believed that the demand for children is influenced by household factors – primarily, household income. This reproductive behavior is natural for an "economic person". At the same time, there are different forms of the reproductive behavior within humankind[4], features of which are necessary to consider while organizing the population's reproduction.

3. ***Economy*** has a richer content than an actual organization of production. It is not just the organization but everything that is exposed to organization being its direct – objective – environment[5]. Thus, ***the economy of population*** is a humankind's activity on organizing the population's reproduction that includes organizational activities at the level of regions, states, civilizations, humanity, and population itself. According to Yu.M. Osipov's definition, the theory of economy studies the structure of economic life, i.e. its characteristic relationships, laws and mechanisms, efficiency of economic institutions and systems' functioning, its dynamics and development trends, the impact of economic life on nature and society[6].

4. Each social economy is a system, a set of private economic systems, i.e. families. Families are not just elements of social reproduction of population but also its organic components. Economies differ in various devices and methods of organization. The main function of the economy is the production of goods, in case of population economy – people. In an economic life, a person is presented and expressed by labor. Population reproduction is a special sphere of labor that includes intra-family relations and branches of the country's ***socio-demographic complex***. It includes sphere of services (health and medical services; all forms of education; social security and services for various categories of the population that require public care and state support; culture, recreation and tourism; physical education and sports); agri-food complex, including food production and processing; housing and communal services; light industry; passenger and personal transport, personal communication[7]. The composition of branches of this complex has changed historically because it depends on means of population economy, which are formed as a result of the mankind's historical development. The socio-demographic complex is formed at the global, national, and regional levels. In other countries, it was characterized by evolutionary development, and it went through two bifurcation points in 1917 and 1991 in Russia. In this regard, the history of the formation of this complex should be reviewed at three historical intervals – before 1917, from 1917 to 1991, and since 1991. Each one had its own means of population economy.

[4] While implementing the RHSF grant no. 16-02-0029 "Sociodemographic evolution of Russia and other BRICS countries: Regularities, tendencies, and prospects" (2016–2018), we studied features and trends of family dynamics in BRICS countries [5] and features of sociodemographic processes and its regulation at the macro-level in BRICS. countries [6]. The conducted analysis showed that different civilizations are characterized by special characteristics of intra-family behavior and its macro-regulation.

[5] Osipov Yu.M. *Teorija hozjajstva: ucheb. v 3-h t., tom 1.* Moscow: Izdatel'stvo MSU, 1995. 458 p.

[6] *Ibidem*, p. 30.

[7] In case of expanded interpretation of the sociodemographic complex of a country, it may include retail trade and banking services for the population.

5. The theory of ethnogenesis [7] implies an overview of a nation as a synthesis of ethnic groups included in it. For the Russian Empire, the Russian ethnic group was the bond. However, in such a multi-ethnic state as the Russian Federation, the analysis must proceed from the synthesis of sociodemographic processes occurring in various ethnic groups. In this regard, the sociodemographic complex of the country may be overviewed at the macro-level and with the allocation of regions: Moscow, St. Petersburg, Muslim regions in the European part of Russia without the North Caucasus, the North Caucasus, other European part of Russia without the Arctic, the Far East without the Arctic, Siberia without the Arctic, Russian Arctic regions. Each one possesses features of self-preserving behavior of the population, different natural and climatic conditions, GRP per capita, migration flows, which affects the nature of the functioning of its sociodemographic complex.

6. A special role in population economy belongs to the state. Yu.M. Osipov notes that the state must run the economy, and the economy is inseparable from the state, its power will, and social functions[8]. Primary stages of state regulation of sociodemographic processes in Russia are described in our monography [8]. To implement the economic function of the state in organizing reproduction of the population after 2024, we propose to develop and adapt the Social doctrine of the Russian Federation by 2025. The head of domestic scientific sociodemographic school, RAS counsellor N.M. Rimashevskaya suggested developing a social doctrine back in 2003 [9]. In 2010, the Center of S.S. Sulakshin published a monography with the methodology of creating such doctrine [10]. A Social doctrine should become a federal law that would define the method of population management in Russia after 2025.

Thus, we examined main provisions of our proposed theory of population economy. The development of a Social doctrine of the Russian Federation in the environment of depopulation is primarily related to the creation of optimal conditions for organizing reproduction of the population in the country, that is, with population economy. At the same time, this document must contain provisions that allow maintaining the state of social security in Russia.

Let us look at main points that need to be taken into account in a doctrine.

1. Experts predict a sharp reduction of traditional jobs due to the transition to the "digital economy" and the robotization of production[9]. With the increased retirement age in the country, the issue of employment of able-bodied population arises. At the same time, the reduction of working age cohorts and the increase of the dependency burden on able-bodied population are predicted [11]. All these issues should be connected in order to develop the most favorable social population policy.

2. "Demographic waves" create cyclical fluctuations in Russian sociodemographic processes. Own social policy should be developed for each qualitatively homogeneous period of such "wave".

3. Earlier, we have already mentioned the regional heterogeneity of Russian socio-demographic processes. That is why the development of a Doctrine should be directed from the federal level to the regional one and vice versa through its step-by-step connection.

4. The development of a Social doctrine of the Russian Federation implies its adoption

[8] Osipov Yu.M. *Teorija hozjajstva: ucheb. v 3-h t., tom 1.* Moscow: Izdatel'stvo MSU, 1995. 458 p.

[9] Accelerating Workforce Reskilling for the Fourth Industrial Revolution. *WEF,* 2017. Available at: https://www.weforum.org/whitepapers/accelerating-workforce-reskilling-for-the-fourth-industrial-revolution (accessed 01.08.2019).

as a federal law (similar to the RF Military doctrine) for a certain time interval.

5. In relation to the current situation with population problems in Russia, it is necessary to include two points in the structure of a Doctrine: first, the problem of preventing accelerated depopulation of the Far East, and, secondly, the transition from the domination of agricultural holdings to the growth of the number of peasant farms and agricultural cooperation as the basis of rural development.

A Social doctrine of the Russian Federation may become an instrument of the state sociodemographic policy, conducted at the national level, considering territorial features of a multinational state.

While developing a Doctrine, it is necessary to move from extrapolation to accounting the cyclical nature of socio-economic and demographic processes. It will increase the adequacy of forecast calculations.

2. Cycles of Russian sociodemographic development

Traditionally, demography studies constant renewal of population as the substitution of generations of people for new generations. It may be considered as a cycle[10]. A generation is a sociodemographic and cultural community that unites people of approximately the same age. Generational boundaries have historically changed with population's age structure shifts and life expectancy. The generational change law reflects constants of society's cyclical dynamics. It allows us to review cyclical processes as the subject of demography as a social science[11].

It seems that a combination of cyclical and aperiodic processes creates a unique nature of the dynamics of reproduction of the world, civilizations, and individual states' population.

The analysis of demographic processes using historical approach showed the presence of long cycles. The first extralong demographic cycle took place during the neolithic revolution and primitive society, the second one – during the slave-owning civilization, the third one – in the Middle Ages, the fourth one – during early capitalist and capitalist civilizations [12]. In our research, we focus on features of the 500-year period of the last extralong demographic cycle in Russia.

The selection of such interval of our country's development is caused by the fact that long-term (quadricentennial) development cycles had been chosen before. For example, in studies of the Institute for Economic Strategies, it is possible to find a proposed hypothesis on the presence of special long-term cycles in Russian history. It was also confirmed by calculations using the theory of social turbulence and classic methods of historical science. The authors of the hypothesis call these cycles "the rhythm of Russian history, its amazing chronon" [13, p. 5].

In addition to long-term demographic cycles, scientists identify periodic medium-term oscillatory processes in reproductive and socio-cultural areas, which affect the nature of demographic processes. These processes may be called sociodemographic. They are studied by the scientific school of N.M. Rimashevskaya.

In economic reproduction processes, the driver of the reproduction development is scientific and technological progress. It sets the pace of fluctuations by creating epoch (for centennial cycles), basic (for long-term Kondratiev waves and the change of technological generations), improving (for

[10] Dobrokhleb V.G., Dzhavadova S.A. *Demografija: kurs lekcij*. Moscow: RGGU, 2012. 247 p.

[11] The sociological analysis of generations conducted by E.I. Ivanova in her dissertation research "Socio-demographic generations of modern Russia: Reproduction and interaction" is of interest. Available at: https://famous-scientists.ru/list/14614 (accessed 21.12.2019).

medium- and short-term cycles and the change of technological generations) innovations.

According to S.Yu. Glaz'ev, not only reproduction processes transform in the transition of the economy from one technological order to another, but there is also a change of the global economic order. The scientist identifies trade-monopolistic, imperial, industrial, and integral global economic systems; each one has a family-generic circuit that ensures the population's reproduction [14]. This circuit retains relative autonomy taht allows preserving historical memory and the ability of public consciousness to regenerate social structures. The collapse of this circuit, according to S.Yu. Glaz'ev, is accompanied by an explosion of uncontrolled social energy and aggression.

The study of Klaus Schwab [15] also shows that current scientific and technological revolution, observed in global economy, leads to the change of characteristics of reproduction processes, including those selected by S.Yu. Glaz'ev in the family-generic circuit.

Thus, economic reproduction processes are influenced by cyclical fluctuations that affect the socio-demographic dynamics. However, in scientific literature, there are descriptions of cycles in the socio-cultural sphere, which affects society's sociodemographic characteristics. The issue of the influence of socio-cultural factors on characteristics of demographic processes was studied by Zh.A. Kalabaeva[12]. Oscillatory sociocultural dynamics was noted by many scientists. The sociologist Pitrim Sorokin [16] said that there are fluctuations from the sensuous socio-cultural order to the ideational one and vice versa in the global history; the integral sociocultural order is possible. A.S. Akhiezer writes that there is a periodic inversion of public consciousness in socio-cultural areas of Russia, which is explained by the Russian specifics of overcoming public discomfort [17].

An economist V.T. Ryazanov described repeated transitions from liberalism to conservatism that took place in the country in the 19–20th centuries [18]. A researcher of historical sociology B.N. Mironov analyzed the characteristics of natural reproduction of the population in the Russian Empire in the 19–early 20th century [19]. It is the period of the end of the early capitalist and the beginning of the capitalist cycle of social reproduction in the country. B.N. Mironov convincingly showed that there was the transition from a traditional to a modern type of population reproduction during that time: from a compound family to a small one (in the author's interpretation) and from authoritarianism to democracy in family relations.

In addition to long-term cycles within the scientific civilizational approach, scientists [20; 21] put forward a hypothesis on three "waves" of mankind's development. During the transition from the second to the third "wave", a social phenomenon "demographic transition" emerged.

The consideration of cyclicity in the analysis of sociodemographic processes is a new direction of studies. For its implementation, it is necessary to build an interconnected system of interactive simulation models that describe the flow of processes of different durations in their interdependence, which makes the study interdisciplinary. The transition to computational capabilities of modern "digital technologies" will allow implementing this task in practice while predicting long-term sociodemographic processes. However, it will be necessary to review the historical sociodemographic dynamics in the long-term retrospective for such forecasts.

[12] Zh.A. Kalabaeva. The place of socio-cultural factors in the research of demographic processes. Available at: https://cyberleninka.ru/article/n/mesto-sotsiokulturnyh-faktorov-v-issledovaniyah-demograficheskih-protsessov/viewer (accessed 21.12.2019) .

In our country, in the reviewed 500-year period, the natural population reproduction, evaluated at the macro-level, has gone through four points of bifurcation – the beginning of 17th century, 1861, 1917, and 1991. At this historical interval, it is necessary to consider consequences of "Time of Troubles", the periods before the abolition of serfdom, before the revolutions of 1917, before the collapse of the USSR in 1991, and after the collapse of the USSR in the Russian Federation. Each period is characterized by its own reproduction parameters, the formation of which was influenced by general cyclical processes in the demographic world order.

3. Demographic development of Russia at different historical intervals

Demographers argue about the possibility of regulating demographic processes. Some of them believe that state regulation of demographic processes is possible only in countries like socialist China. In this regard, the 1990s demographic crisis in Russia, first, is not a consequence of the implementation of country's reforms in the form of "shock therapy", but the "second demographic transition".

However, there is also a different opinion in scientific literature: mechanisms and institutes of state regulation directly or indirectly affect the nature of the flow of sociodemographic processes. To support it, we will review how bifurcations in the political and socio-economic development of the country affected the socio-demographic characteristics of the population over a long historical interval. To do this, we examine four points of the formation, flourishing, and then decline of the four-century stage of the fourth-generation Eurasian civilization in the North of the Eurasian continent – "Time of Troubles", 1861, 1917, and 1991. It was the time of constant change of mechanisms and institutes of state regulation in Russia. Three of these years (except for 1861, when, as the result of state reforms, the Russian Empire received an impulse to accelerated development) may be characterized as social catastrophes in the development of Russia [22; 23].

"Time of Troubles"

According to experts, in 1500, 12–15 million people lived on the territory of Russia. The reign of Ivan the Terrible (1530–1584) turned out to be a crisis for the socio-economic development of the country. It was facilitated by the oprichnina and the three-year famine of 1569–1571, which killed hundreds of thousands of people; cannibalism also took place. As a result, the population of Moscow reduced by three times, and the countryside was depopulated. Most of the land was not cultivated. Thus, in the Moscow Uyezd, at the time of Ivan the Terrible's death, 5/6 of crop lands was not sown [17, p. 97]. During the reign of Boris Godunov in 1601–1603, the country experienced an unprecedented famine once again. All of this led to the social catastrophe of "Time of Troubles". N.I. Kostomarov defines "Time of Troubles" as the period of 1604–1613. He writes that "Time of Troubles will remain an extremely significant epoch in Russian history as the evidence of the strength of the inner life of people – an important prerequisite for its future" [24, p. 777]. After such a shock, the country was reborn. In 1796, its population was 36 million people, in 1851 – 69 million [17, p. 137].

The reform of 1861

To study the impact of consequences of the 1860s reforms on the abolition of serfdom in the Russian Empire concerning the population reproduction, we need to discuss features of the reproductive behavior of Russian population before reforms.

We may find statistical data on population of the Russian Empire before reforms in V.O. Klyuchevsky's work[13]. According to the 8th revision (1833), the serf population constituted for almost 45% of the whole population in the European part of Russia, and according to the 10th revision (1856) – 34.4%. In 23 years, the share of the serf population declined by 10.5%. According to the 8th revision, there were 127 thousand noblemen in the European part of Russia who had serf people. In particular, 43 thousand gentries had 340 thousand males, and 14 thousand major landowners had 8 million males.

Thus, it is possible to assume that, before the 1861 reforms, the share of serf population in the European part of Russia could decrease primarily due to physical extinction of such people, because cases of the serfdom liberation at that time were very rare. At the same time, there was a strong stratification according to the level of the "serf wealth" among landowners – the ruling class.

According to the 10th revision, population of the Russian Empire was 62.5 million people of both genders. There were 103 thousand noblemen's estates with 10.5 million serf males included in a census list in the European part of the Empire. Since 1859, more than 44 thousand estates with more than 7 million such people have been pledged. Consequently, averagely, there were 100 serf males per one noble estate in the European part of Russia. At the same time, 67% of serf males were pledged from 43% of noble estates. Such statistics indicate the economic crisis of Russian agriculture in the middle of the 19th century, the extinction of serf families, and the impoverishment of noble families.

Let us take a look at the change of the reproductive behavior of Russian Empire's population in the post-reform period (and, consequently, the reproductive behavior of peasants, who constituted for the most part of the country's population).

After the all-Russian census of 1897, the population of the Russian Empire was 126.411 million inhabitants, while 16.290 million people (12.9%) lived in cities[14]. Consequently, with a drastic change of socio-economic conditions, the country's population has doubled in 40 years since 1857. The further growth of the population of the Russian Empire before 1914 was also very rapid (*Tab. 2*). In 16 years, the Empire's population increased by 41.4 million people.

In 1906, D.I. Mendeleev published a work entitled "Towards the Knowledge of Russia"[15], in which, on the basis of the results of the 1897 census, a long-term forecast for Russian population was made (*Tab. 3*).

As we see in table 3, the forecast for the population reproduction regime in 1987–1906, without taking into account the revolution, famine years, wars, "shock therapy", "demographic transition", according to D.I. Mendeleev, promised the transformation of Russia into one of the most populated countries in the world.

Revolutions of 1917

Socio-economic changes, which happened after 1917, were universal; they affected almost every aspect of human life including models of behavior, the system of values, forms of family, models of family relations, adaptive

[13] Kljuchevskii V. *Polnyj kurs lekcij po istorii Rossii*. Available at: http://www.bibliotekar.ru/rusKluch (accessed 22.12.2019).

[14] *Naselenie imperii po perepisi 28-go janvarja 1897 g. po uezdam*. Available at: http://istmat.info/files/uploads/15771/perepis_1897_vypusk_1.pdf (accessed 22.12.2019).

[15] Mendeleev D. *K poznaniju Rossii*. Available at: http://alcdata.narod.ru/Mendeleev_K_poznaniyu_Rossii_1907/Mendeleev_K_poznaniyu_Rossii_1907.pdf (accessed 22.12.2019).

Table 2. Natural population growth in Russia in 1897–1913 (with amendments), thousand people

Year	European part of Russia	Privislinsky Guberniyas	Caucasus	Siberia	Central Asia	Total
1897	1725.1	180.3	141.2	115.1	103.1	2264.8
1898	1479.5	185	142.4	95.7	107.6	2010.2
1899	1761.2	184.3	144.1	105.9	110.2	2305.7
1900	1803.5	188.6	164	101.5	112.6	2375.2
1901	1592.1	185.4	161.7	129.3	116.3	2184.8
1902	1798.9	229.3	163.6	111.3	109.3	2412.4
1903	1884.4	195.8	172.6	143.7	121.5	2518
1904	1981.5	176.6	186.2	113.2	125.2	2582.7
1905	1431.6	158.9	168.9	96.7	124.5	1980.6
1906	1875.2	186.1	186.5	127.5	127.2	2502.5
1907	2122.1	194.9	194	130.6	128.2	2769.8
1908	1864.9	196.2	177	151.3	131	2520.4
1909	1712.3	190.4	172	165	135.9	2375.6
1910	1569.9	198.7	154	198.4	145	2266
1911	2051.6	205.9	182.1	189.7	149.8	2779.1
1912	2060.4	208.1	215	185.8	154.6	2823.9
1913	1987.5	-208.1	218.6	184.8	155.5	2754.5
Total for 1897–1913	30706.7	3272.6	2943.9	2345.5	2157.5	41426.2

Source: Sifman R.I. *Dynamics of the Russian population in 1897–1914. Demoscope*. Available at: http://demoscope.ru/weekly/knigi/polka/gold_fund05.html (accessed 22.12.2019).

Table 3. D.I. Mendeleev's forecast for Russian population in the 20th century

Year	Million people	Year	Million people
1897	128.2	1904	142.3
1898	130.2	1905	144.5
1899	132.1	1906	146.6
1900	134.1	1910	155.6
1901	136.1	1950	282.7
1902	138.2	2000	594.3
1903	140.2		

Source: Mendeleev D. *K poznaniju Rossii*. Available at: http://alcdata.narod.ru/Mendeleev_K_poznaniyu_Rossii_1907/Mendeleev_K_poznaniyu_Rossii_1907.pdf (accessed 22.12.2019).

strategies of a personality, gender roles of men and women. In post-revolutionary Russia/USSR, huge masses of people were affected by marginalization. It primarily included the loss of a previous social status and uncertainty of the present, transformations of the content of gender roles and the model of human reproductive reproduction, and a quite sharp breakup with the socio-cultural tradition, which was also manifested in relation to the family. In the post-revolutionary period, the family social institution underwent significant changes.

Since the beginning, the Soviet state began to actively reform civil legislation, including the part regulating marriage and family relations. First, the Orthodox Church was excluded from the regulation process. Thus, in December of 1917, it was deprived of the right to register births and marriages, and a civil marriage was introduced as the only legally valid one.

In a situation of the civil war and devastation, such radical reforms of family relations caused the change of the dynamics of Russian

population. Detailed statistics for these years are not available, so we can only use individual data from disparate sources.

According to the statistics for the end of 1916, there were 186 million people in the Russian Empire; there was the 60 million increase in 16 years[16]. V.I. Lenin in 1921 thought that 1.2–2 million Russian immigrants lived abroad[17]. In some sources, it is possible to find fragmentary information on population losses in certain regions. On February 1, 1917, 2.017.173 people lived in Moscow. According to the August census of 1920, there were 1.028.218 residents in Moscow. In other words, the decrease of Moscow population was 49%. There are no similar examples in European history concerning population dynamics in a major city. Only St. Petersburg surpassed Moscow in terms of depopulation. Its population was 2.440.000 people in 1917. According to the census of August 28, 1920, the city had only 706.800 inhabitants. Since the revolution, the number of residents decreased by 71%. In other words, the population there was declining almost two times faster than in Moscow[18]. The same dynamics on the number of Petrograd's residents in those years is given in the HSE journal "Demoscope"[19]. Consequently, it is possible to say that the radical change of the traditional model of a Russian family under the Soviet regime significantly worsened the decline of Russian population, which was observed in the country in 1917–1921 because of the civil war and devastation.

Such population dynamics forced the country's leadership to drastically change the USSR family legislation in the 1930s. This process culminated in 1936, when a new family code that prohibited abortion was adopted. "Free love" was branded as anti-socialist, and the state began to fight for family strengthening.

The next stage of active demographic policy in the USSR was the post-war revival of population. The demographic situation in the country in 1941–1945 was determined by huge irretrievable losses among military and civilian population. The government adopted a special program of active demographic policy aimed at overcoming consequences of the war (Decree of the Presidium of the Supreme Soviet of the USSR of July 8, 1944). The most important provisions of the Decree concerned the active promotion of large families (with five or more children) and the support for families with an optimal number of children (with three or four kids). In accordance with the Decree, maternal labor was encouraged morally and financially. These measures helped restore the country's population in the period from 1941 to 1956 (*Tab. 4*).

Table 4. The number of population in the USSR

Year	Million people	Year	Million people
1917	91.000	1960	119.046
1941	111.359	1970	130.079
1950	101.438	1980	138.291
1956	112.266	1990	148.041

Source: *Population of Russia for100 years (1897–1997): Stat. Coll.* Moscow: Goskomstat Rossii, 1998. 222 p.

[16] Shramko S. *Russia in 1917–1925. The arithmetic of losses*. Available at: http://www.proza.ru/2013/09/04/701 (accessed 23.12.2019).

[17] *Ibidem*.

[18] *Ibidem*.

[19] Population of the Northern capital. *Demoscope Weekly,* 2004, no. 163–164, August 1–15. Available at: http://demoscope.ru/weekly/2004/0163/tema01.php (accessed 23.12.2019).

The active demographic policy in the USSR was also carried out in the 1980s, and it had a positive impact on the country's birth rate.

1991

N.M. Rimashevskaya described in details changes that occurred in a Russian family since 1991 after the transformation of Soviet society [9]. The main ones are:

1. As the result of socio-economic transformations, a family received an independent economic status, and the paternalism of the state over all of its economic spheres ceased.

2. At the same time, external conditions of Russian families' existence significantly deteriorated, especially during the years of "shock therapy".

3. The Communist party's control over "moral foundations" of Soviet society, including intra-family behavior, completely ceased.

4. There was an extreme stratification of society into the poor and rich, and a significant part of population was marginalized.

As the result, as the number of marriages decreased (from 8.9 per 1000 population in 1990 to 6.2 in 2000), the number of divorces increased (from 3.8 per 1000 population in 1990 to 4.3 in 2000), the birth rate fell (from 13.4 per 1000 population in 1990 to 8.7 in 2000), and the death rate increased sharply (from 11.2 cases per 1000 population in 1990 to 15.3 in 2000), especially among able-bodied men[20].

Thus, changes at the state level, which occurred in 1991, negatively affected natural reproduction of population. However, since 2000, Russian authorities have begun to understand the severity of the country's negative demographic processes. Since 2007, the catastrophic situation with natural population reproduction has been reversed. The first stage of depopulation in Russia had ended before 2013, but the second stage of depopulation began in 2017 [25]. A small contingent of people who formed in the 1990s – years of the significant reduction of the birth rate – reached a reproductive age.

Thus, we reviewed changes of the natural reproduction of Russian population over 500 years at four points of bifurcation of Russian legal family environment. At the first point, at the beginning of the 17th century, the country was able to overcome "Time of Troubles" and revive as a sovereign state. At the second point, the reforms of 1861 led to the sharp increase of the birth rate. At two other points – the revolution of 1917 and the reform of the 1990s – there was the decline of the country's population. We assume that ***institutions of the country's state regulation can create conditions that affect the matrimonial, reproductive, and other types of population's demographic behavior.***

Conclusions

In the middle of the 2000–2010s, many scientists predicted an "avalanche" depopulation in Russia [26]. In his Address to the Federal Assembly of the Russian Federation in 2012, Vladimir Putin twice called the country's demographic situation "catastrophic". However, in 2013–2015, there was a natural increase of the population. It was, among other things, caused by the fact that sociodemographic processes have been governed by authorities of the Russian Federation since 2000, and the centralized organization of population reproduction began.

On the basis of this practical activity, in 2012, Yu.M. Osipov proposed to consider sociodemographic processes from an economic position – in the interpretation of the theory of philosophy of economy developed at the Lomonosov Moscow State University

[20] *Russian Statistical Yearbook*. Federal State Statistics Service, 2013.

(Yu.M. Osipov, S.N. Bulgakov). We developed this proposal in the theory of population economy, the main postulates of which are presented in the article. The theory's practical conclusion is the need to develop and adopt a Social doctrine of the Russian Federation at the federal law level by 2025, right after the completion of national projects of the Russian Federation in 2024.

While developing a sociodemographic part of a social doctrine, it is necessary to consider the fact that the "demographic transition" has already ended in Russia. Thus, a new approach to the organization of the country's population reproduction is required [27].

Our historical analysis of various stages of Russia's demographic dynamics over the last 500 years allows us to draw an optimistic conclusion: the country's population has overcome catastrophic periods associated with the decline of population, and it will be able to cope with this task in the 21st century.

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Hierarchical Pareto Classification of the Russian Regions by the Population's Quality of Life Indicators

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Abstract. Improving population's quality of life is a key goal of the state. In this regard, it is very important to correctly measure its level and, accordingly, classify the country's regions by quality of life indicators. Most research in this area involves dividing variables into groups, unifying variables in each group and building an integral indicator, grouping or clustering objects as a linear convolution of variables with weights. Such approaches have their drawbacks due to the subjectivity of expert estimates, instability of the coefficients of the main component, inability to work with ordinal data, etc. Thus, the purpose of this study is to build a methodology for classifying the regions of the Russian Federation by quality of life indicators devoid of the above disadvantages. The proposed method is based on the concept of Pareto optimality well-known in Economics according to which all the regions are divided into disjoint classes. After dividing variables into groups we recommend using Pareto class as a representative of the category instead of the traditional unification and construction of intra-group convolutions, which is obtained after the intra-group Pareto classification, and building the final Pareto classification of the regions of the Russian Federation on the basis of the obtained intra-group Pareto classes. The advantage of the proposed approach is that it can be applied on the ordinal data, that is, when some variables are characterized only by their order and there are no exact values for each region. In addition, the algorithm is undemanding for computing power and does not use expert estimates, except for the selection of research variables.

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The main results of the study are the construction of a classification of the Russian Federation regions by quality of life indicators, comparison with traditional approaches and analysis of the features of the proposed methodology.

Key words: regional ranking, population's quality of life indicators, stratification, Pareto ratio, Pareto dominance, Pareto classification, Pareto optimum, quality of life.

Introduction

Ensuring high quality of life (QOL) of the country's population is the central task of the state power institution in the vast majority of countries around the world. There is no single method for QOL measuring, and therefore there is no single mechanism for achieving the same "high QOL". There is no doubt that this category includes many indicators that reflect various aspects of human life: economic indicators, indicators of the social sphere, access to public goods, the state of the environment, the level of security, and so on. In addition to the conditions that are common to the country's entire population, the life of each individual is greatly affected by purely individual living conditions, such as the quality of health, marital status, and religious affiliation. In this regard, QOL is commonly referred to as a synthetic latent category.

As a rule, the general public estimates QOL in a given territory based on the GDP level or the related indicators (GNP, GRP per capita, etc.). However, the Easterlin paradox, described in 1974 [1], got us thinking about how plausible it is to measure QOL based on monetary indicators. Therefore, in order to explore the possibility of assessing economic results and social progress without relying on GDP indicators, a special Commission headed by J. Stiglitzand and A. Sen was created in 2008.

The Commission proposed three strategies for studying QOL. The first approach actually measures individual life satisfaction proposing to use the data from current surveys on how happy or satisfied individuals are with their lives. The second approach considers human life as an indivisible combination of various types of human activity and the personal freedom of choice of specific actions. The easier it is for a person to choose or do a specific action aimed at achieving his or her personal goals, the higher the QOL score is. The third approach involves weighing the QOL determinants for each individual or a group of individuals based on a subjective system of preferences. In other words, a certain list of human life spheres influencing the QOL is selected, and then either the individual is asked to independently assess the contribution of each of the proposed sphere, or the expert assigns a certain degree of influence on the QOL to the determinants. On the one hand, this approach avoids averaging the QOL assessment within the community, but, on the other hand, the mechanism of expert assessment cannot technically be unified for society as a whole.

There are two ways to track QOL indicators. The first is the construction of integral indicator (II) combining various aspects of human life that allow you to assess the success of the selected region, or community: the presence of a numeric expression QOL facilitates the territories ranging, makes it possible to compare them with each other, allows for a dynamic analysis. An alternative way to determine the level of QOL is to track a large number of well-being II simultaneously.

Today, we can talk about the "standard" method of calculating the QOL II: in the vast majority of studies, QOL is calculated as a linear convolution of a function, i.e.

$$f\left(x^{(1)}, x^{(2)}, \dots, x^{(p)}\right) = \sum_{j=1}^{p} a_j x^{(j)} \quad , \quad (1)$$

where $x^{(j)}$ is a statistical indicator,

and w_j is the weight of the indicator determined by an expert way [2].

Similarly, the most cited QOL indicator, the Human Development Index (HDI) is calculated, which was developed by the UN in collaboration with A. Sen in 1990. HDI is a linear convolution of GNI by PPP per capita, life expectancy at birth and the level of education in the country.

Depending on the source of data which may be the results of a population survey or statistical collections, QOL indicators are usually divided into subjective (for example, Gallup-Healthways Global Well-Being index) and objective (already mentioned HDI), there are also indicators based on a combination of both approaches (Better Life Index).

The disadvantage of the "standard" method of QOL II calculating is the need to conduct an expert assessment of the indicators weight. And if when calculating the Better Life Index, the user assigns the contribution of the indicator (which, however, is already an II, and therefore it is formed using expert estimates of the indicators weight) to the final index, then the individuals are not involved in determining the calculation method for the rest of the indices. Thus, there will always be misrepresentation of information when moving from statistical data to the final II when calculating QOL II in this way.

Another method for QOL II calculating is described by S.A. Ayvazyan [3]. The author suggests reducing the number of model's regressors using the principal component method. The initial explanatory variables are divided into blocks that characterize one area of human life: the quality of the population, the welfare (standard of living) of the population, social security (quality of the social sphere), the quality of the environment (ecological niche), and natural and climatic conditions. Then, there are two ways depending on the features of the model, either the II is calculated using the main components method separately for each block, and then the block II are combined into a final single index; or the main component is immediately found for all regressors simultaneously, then it becomes the final II QOL. The advantages of the method are the exclusion of expert evaluation of weights determining, ease of use and relative ease of calculation.

The method proposed by S.A. Ayvazyan is criticized because of the instability of determining weight coefficients, which is explained by the peculiarities of calculating the main components and cannot be corrected using standard statistical data processing packages [4].

The disadvantages associated with building a single II QOL can be overcome by using an alternative approach of simultaneously tracking a large number of well-being II. Its followers note that when information is rolled up into a single indicator, first, there is always a distortion and/or loss of information, and second, there are always difficulties in determining the share of indicators' contribution to the final II. Some countries have successfully implemented the programs of improving the population's QOL by tracking individual indicators: in Australia it is Measures of Australia's Progress, in the UK it is Measuring National Well-being program, in New Zealand it is The Quality of Life Project, etc. The projects involve tracking more than 40 indicators, the composition and number of which can be either unchanged (as in the case

of New Zealand since 1999) or changing (in the UK, 41 indicators were estimated in 2015, and 43 in 2016). It is obvious that QOL assessment is devoid of researchers' subjective contribution within this approach [5], but the complexity of the process, as well as the inability to assess the progress of social and economic development of the territory over time, make it less attractive to the general public.

In order to achieve the main purpose of the research, i.e. ranking Russian subjects by QOL level, we propose a method of QOL analysis that, first, is devoid of the researcher's subjective intervention, second, allows comparing the regions with each other even by ordinal data, and third, would be technically easy to implement.

Russian regions today are highly differentiated by all indicators, macro-economic and micro-economic ones; however, there is no doubt that some constituent entities, such as Moscow, Saint Petersburg, and the Krasnodar Krai, are the territories with a higher QOL level. This is evidenced, on the one hand, by the direction of internal migration flows [6], and on the other hand, by the high level of real estate prices [7]. Therefore, we propose to divide the constituent entities into classes, identifying the leading and outsider regions in terms of QOL indicators, and then analyze these classes, which can help the Institute of state power in finding the methods to increase the QOL level.

Multi-criteria classification methods

Quite often, in practice, there is a need to classify the sample according to many criteria simultaneously, for example, when selecting reliable banks or companies with high investment potential.

The multi-criteria classification task can be formulated as follows. Suppose there are N objects each having P characteristics. After completing the task, we will get K classes (where K is not known in advance), each of them contains objects that are as close to each other as possible by all P characteristics.

The vast majority of methods that can be used for multi-criteria classification require the researcher's intervention: the method helps to rank objects by their attractiveness or success rate. Then they should be divided into classes according to the II value in an expert way. To solve this problem, the following methods can be used:

- *K-means method and its modifications*

The method is based on the assumption of geometric proximity of objects to each other in the P-dimensional space of descriptive indicators. When using the method, to identify the optimal number of classes, a certain optimality criterion is needed that sets the distance between the cluster centers. The method is used to identify high-risk countries [8].

- *Ranking the sample by the index value based on linear convolution*

A system of weights of characteristics in the final index should be put in to implement this method. Then the array of source objects ranked by the index value can be divided into classes in an expert way. II option constructed using the principal component method was used in [9] to classify countries by the level of social comfort of the population.

- *Ranking by influence*

Researchers San, Han, Zhao, and others [10] proposed an algorithm for rating authors of scientific papers. The essence of the method is as follows: the more important variables are highlighted among all the explanatory ones. A higher rank is assigned to the objects with a high value of more important criteria. Then all explanatory variables for high-ranked objects are analyzed: the greater the contribution of the criterion to the high-ranked object is, the higher the weight of this criterion is throughout the system.

• *Ranking according to the Borda rule*

The method was used to analyze the performance of regional bank branches [11]. Objects are ranked separately for each of the criteria, and the final rank is obtained by simply summing the ranks for each criterion.

• *Classification based on linear optimization of weights*

The method is often used to divide the company's raw materials by the degree of importance in inventory management [12; 13]. First, the linear programming problem is solved sequentially for each object relative to the weights, and then the objects under consideration are ranked based on the resulting weight vector.

• *Linstrat method*

Stratification occurs by combining the neighboring objects projections on a hyperplane defined by weights of criteria. The implementation of the method based on the data of bibliometric indicators of journals and countries is proposed [14].

• *Pareto Classification*

There are non-dominated objects grouped into a single class at each step of the algorithm in the original sample. At the next step, the objects are excluded from consideration, and the procedure is repeated for the remaining objects. The method is well known for a long time [15; 16; 17]. It is possible to specify the works considering the Pareto ratio as an object [18; 19], but it is used relatively rarely when studying the quality of life [20; 21].

We will use Pareto classification n the research.

Pareto classification

Suppose there are two regions, a and b, each having a characteristic vector $\overrightarrow{x_i^a}$ and $\overrightarrow{x_i^b}$, where $i = 1, \dots, p$ is responsible for the feature number; in total, p features are considered in each region. Let's say that object a is Pareto dominant over object b if two conditions are met simultaneously:

1. $\forall i: \quad x_i^a \geq x_i^b$,
2. $\exists i: \; x_i^a > x_i^b$.

In other words, region a is Pareto dominant over region b if region a is no worse than region b by all the considered features, and there is at least one feature where region a is strictly superior to region b. We should that the Pareto dominance ratio may not exist between two randomly selected objects.

Suppose there are n objects (regions), each having a feature vector $\overrightarrow{x_i}$. Let's call object a Pareto optimal if there is no object dominating a among the objects in the sample. By checking each region for Pareto dominance, we get a subset of Pareto-optimal regions. Let's call this subset the first Pareto class. In other words, a region is included in the first Pareto class if it is impossible to specify another region that is not worse by all its indicators than the one under consideration, and is strictly better by at least one of the indicators.

Excluding the regions of the first Pareto class and selecting the Pareto-optimal regions from the remaining ones, we get a subset of the regions that form the second Pareto class. We perform this procedure until unclassified regions remain in the sample. Thus, as a result, the original set of regions is represented as a sequence of disjoint non-empty subsets. In this case, for each region from a lower (with a higher number) class, there is at least one region from a higher Pareto class that is Pareto-dominated.

We should emphasize that it is impossible to predict the number of Pareto classes obtained in advance. So, when all pairwise rank correlation coefficients are close to unity, the division into Pareto classes is very fractional, and the

number of classes is close to the number of regions. In the reverse degenerate case, when there is at least one pairwise rank correlation coefficient close to minus unity, the number of Pareto classes is small; it is quite possible that all regions will be assigned to a single first class. In practice, the latter situation is not possible in the problems of quality of life research, since the more the variables used are ordered "the better the quality of life is", which determines a direct rank relationship between the variables and a rank correlation coefficient that is obviously different from minus unity.

Research methodology

Let's highlight the main stages of the research:

- data collection;
- formation of a posteriori set of the grouped partial criteria;
- logical unification;
- Pareto classification of the regions within the groups;
- Pareto classification of the classes in all groups.

The formation of a posteriori set of partial criteria is based on the selection of a list of partial indicators $x^{(1)}, x^{(2)}, \ldots, x^{(p)}$, which are obtained from the original a priori (theoretical) list of statistical indicators $x^{(1)}, x^{(2)}, \ldots, x^{(k)}$, provided $k \geq p$. This set of indicators should sufficiently characterize the analyzed synthetic category of quality of life. The variables that characterize similar aspects are grouped together. The selected indicators are called private criteria, and the set of the grouped selected indicators of quality of life is called a posteriori set of private criteria [2].

Logical unification means bringing all data in a comparable form.

This transformation will allow to:

- get rid of the influence of the region size on the criteria value;
- rank the criteria values by relative, rather than absolute, characteristics;
- compare the regions with each other regardless of the regions' size.

The next step of unification is widespread [2; 9]. It consists in switching to [0; N] – point scales in measuring particular quality of life criteria. The value 0 corresponds to the lowest quality of life, and N – to the highest. Within the framework of this research, the value of N is 10.

If a particular criterion x is associated by a monotonically increasing dependence with the integral property of life quality (i.e., the higher the value of x, the higher its quality value), then the unified variable is calculated by the following formula:

$$x_i = \frac{x - x_{min}}{x_{max} - x_{min}} \times N, \qquad (2)$$

where x_{min} is the smallest value of the original indicator (the worst);

x_{max} is the highest value of the original indicator (the best).

If a particular criterion x is connected by a monotonically decreasing dependence with an integral property of life quality (the higher the value of x, the lower its quality value), then the unified variable is calculated as follows:

$$x_i = \frac{x_{max} - x}{x_{max} - x_{min}} \times N, \qquad (3)$$

where x_{min} is the smallest value of the original indicator (the worst);

x_{max} is the highest value of the original indicator (the best).

We should note that the result of Pareto classification will not change if, instead of the generally accepted unification procedure described above, we restrict ourselves to ranks with ascending sorting for variables having a positive impact on the quality of life, and descending ordering for the rest.

Next, a Pareto classification is performed for a set of variables within each group. As a result, each region gets the class number it belongs to within this group of variables.

Then a Pareto classification is performed based on the results obtained, which makes it possible to obtain Pareto classes of regions based on their intra-group Pareto classes.

Research information support

The empirical part of the research is based on the data from the statistical digest "Regions of Russia. Socio-economic indicators. 2016". The digest contains information on the development of industries and sectors of the economy for the period of 2005–2016 for the subjects of the Russian Federation:

- employment;
- level of welfare and economic status of the population;
- ecological situation;
- development of the social security system;
- state of small business;
- dynamics of price levels in the consumer and manufacturing sectors.

In addition, we used the information from the digest "Regions of Russia. Main characteristics of the subjects of the Russian Federation".

Based on the above analysis of QOL indicators in accordance with the requirements advanced by S.A. Ayvazyan in the monograph [2, p. 78] on (a) relevance, (b) information availability and (c) reliability of information, we have chosen 33 private indicators organized in five basic groups of synthetic categories characterizing the population's activity in the regions.

1. Socio-demographic indicators: migration growth, total mortality rates, life expectancy at birth, migration growth rates, labor force, number of registered crimes.

2. Economic and financial indicators: per capita income of the population; gross regional product (GRP); retail trade turnover, wholesale trade turnover; investment in fixed assets; turnover of organizations; cost of fixed assets.

3. Infrastructure indicators: departure of passengers by bus; density of paved public roads; number of hospital beds; stadiums with stands for 1,500 seats or more; flat sports facilities; gyms; swimming pools; quantity of professional educational organizations training middle-level specialists; quantity of higher education organizations; tourist companies; commissioning of apartments; quantity of organizations performing research and development.

4. Environmental indicators: emissions of pollutants from stationary sources into the air; capture of air pollutants from stationary sources; use of fresh water.

5. Production indicators: number of enterprises and organizations; mining; manufacturing; production and distribution of electricity, gas and water; volume of construction work.

The result of Pareto classification of the Russian regions (empirical results of the study)

According to the results of the intragroup Pareto classifications, the regions of the Russian Federation were stratified into the following number of classes in each group of variables:

1. Socio-demographic indicators: 5 Pareto classes.
2. Economic and financial indicators: 11 Pareto classes.
3. Infrastructure indicators: 7 Pareto classes.
4. Environmental indicators: 10 Pareto classes.
5. Production indicators: 9 Pareto classes.

In the supergroup Pareto classification, the regions were divided into 10 classes based on their comparison by the intragroup classes. Detailed stratification results for each region considered are shown in *table 1.*

Table 1. Pareto classes of the regions of the Russian Federation by groups of variables and the final Pareto class

RF Region	Intragroup Pareto classes					Pareto class of the region
	Socio-demographic indicators	Economic and financial indicators	Infrastructure indicators	Environmental indicators	Production indicators	
Tyumen Oblast	1	1	1	1	1	**1**
Moscow	1	1	1	3	1	**2**
Krasnodar Krai	1	3	1	2	2	**2**
Leningrad Oblast	1	5	2	1	4	**2**
Republic of Dagestan	1	5	2	1	4	**2**
Stavropol Krai	1	5	2	1	4	**2**
Kabardino-Balkar Republic	1	9	3	2	8	**3**
Moscow Oblast	1	2	1	3	2	**3**
Republic of Ingushetia	1	11	3	1	9	**3**
Rostov Oblast	2	4	1	2	3	**3**
Chukotka Autonomous Okrug	3	1	5	5	8	**3**
Astrakhan Oblast	3	7	5	2	6	**4**
Saint Petersburg	1	2	2	4	2	**4**
Sevastopol	1	10	3	2	8	**4**
Krasnoyarsk Krai	2	4	2	3	2	**4**
Perm Krai	4	4	3	2	3	**4**
Republic of Bashkortostan	2	4	1	6	3	**4**
Republic of Kalmykia	3	11	6	1	9	**4**
Republic of Tatarstan	2	3	1	7	2	**4**
Sverdlovsk Oblast	2	3	1	7	2	**4**
Chechen Republic	1	9	3	3	7	**4**
Belgorod Oblast	1	5	2	6	4	**5**
Voronezh Oblast	2	4	2	4	4	**5**
Kamchatka Krai	2	3	6	4	7	**5**
Kemerovo Oblast	4	5	2	4	2	**5**
Kostroma Oblast	4	9	4	2	7	**5**
Murmansk Oblast	3	3	5	4	4	**5**
Nizhny Novgorod Oblast	2	4	2	5	3	**5**
Orenburg Oblast	3	5	3	4	3	**5**
Republic of Adygea	1	9	3	3	8	**5**
Republic Of Sakha (Yakutia)	2	3	4	8	3	**5**
Republic of North Ossetia	2	10	2	3	7	**5**
Sakhalin Oblast	4	2	6	5	2	**5**
Tver Oblast	4	7	3	3	5	**5**
Khabarovsk Krai	4	3	4	5	4	**5**
Kursk Oblast	2	7	2	4	5	**6**
Magadan Oblast	4	2	7	6	7	**6**
Novosibirsk Oblast	2	5	2	7	3	**6**
Oryol Oblast	4	8	3	3	8	**6**
Republic of Altay	2	11	6	3	9	**6**
Republic of Crimea	2	6	2	4	6	**6**
Samara Oblast	3	4	2	6	3	**6**
Saratov Oblast	2	6	3	5	4	**6**
Tula Oblast	1	6	2	6	5	**6**
Udmurt Republic	3	6	3	4	4	**6**
Chelyabinsk Oblast	2	4	2	8	3	**6**

End of table 1

RF Region	Intragroup Pareto classes					Pareto class of the region
	Socio-demographic indicators	Economic and financial indicators	Infrastructure indicators	Environmental indicators	Production indicators	
Altai Krai	3	6	2	7	5	**7**
Arkhangelsk Oblast	3	4	4	7	4	**7**
Vladimir Oblast	3	7	2	4	5	**7**
Irkutsk Oblast	3	5	3	6	3	**7**
Kaliningrad Oblast	2	7	3	4	5	**7**
Kaluga Oblast	2	7	2	5	5	**7**
Lipetsk Oblast	2	6	2	9	5	**7**
Omsk Oblast	3	5	2	8	4	**7**
Primorsky Krai	3	4	4	7	4	**7**
Republic of Komi	4	4	5	7	3	**7**
Ryazan Oblast	1	7	3	7	6	**7**
Tomsk Oblast	2	6	4	7	5	**7**
Yaroslavl Oblast	3	6	3	5	5	**7**
Bryansk Oblast	4	7	2	8	7	**8**
Volgograd Oblast	3	5	3	6	4	**8**
Penza Oblast	2	7	3	5	6	**8**
Republic of Mari El Republic	2	9	4	4	7	**8**
Smolensk Oblast	3	7	3	5	5	**8**
Chuvash Republic	2	8	2	5	6	**8**
Amur Oblast	5	5	5	10	4	**9**
Vologda Oblast	4	5	4	8	5	**9**
Jewish Autonomous region	5	9	6	4	9	**9**
Ivanovo Oblast	3	8	2	6	7	**9**
Karachay-Cherkess Republic	2	10	4	4	8	**9**
Kirov Oblast	4	7	4	6	6	**9**
Pskov Oblast	3	9	4	5	7	**9**
Republic of Buryatia	2	8	5	5	6	**9**
Republic of Mordovia	2	8	3	7	7	**9**
Tambov Oblast	3	6	3	7	7	**9**
Ulyanovsk Oblast	3	7	3	7	5	**9**
Zabaykalsky Krai	4	8	5	6	6	**10**
Kurgan Oblast	5	8	4	7	7	**10**
Novgorod Oblast	4	8	4	8	5	**10**
Republic of Karelia	4	8	5	6	6	**10**
Republic of Tyva	3	11	6	4	8	**10**
Republic of Khakassia	3	9	5	9	6	**10**

Let us enlarge on the Pareto classification process directly. We should note that, for example, in the group of "Financial and economic indicators" containing seven indicators, exactly three regions are assigned to the first class. That is, each of these regions did not find another one that was not worse (and in some ways better) by these seven variables. If these three regions are not taken into account, then the other subjects have four more regions that can be called "the best of the remaining", i.e. the second Pareto class for this group is formed by four regions. Similarly, an intragroup classification is constructed for each group of variables.

As can be seen from table 1, the final Pareto classification divided the subjects into ten classes on the basis of the intra-group classifications results. The first Pareto class which is the highest one, includes only one region, the Tyumen Oblast. It was assigned to the first class in all groups of variables. The second class consists of five regions: Moscow, Krasnodar Krai, Stavropol Krai, Leningrad Oblast, and the Republic of Dagestan. The third class also includes five regions: the Moscow and Rostov Oblasts, the Kabardino-Balkar Republic, the Republic of Ingushetia, and the Chukotka Autonomous Okrug. Classes four through ten consist, respectively, of 10, 14, 11, 13, 6, 11, 6 regions.

Results discussion

We should note, that the results generally correlate well with the regions classifications known to the author, taking into account a radically different ranking method. Thus, the subjects that are traditionally classified as leading regions are located in the upper classes in the case of Pareto ranking, while those that are usually classified as depressed, i.e. outsider regions, occupy mainly the last classes.

Let us compare the results obtained with the results of the works known to the author. B.M. Grinchel and E.A. Nazarova give generalized point estimates of the quality of life in the regions of Russia [22, p. 118]. In the study of the Ministry of economic development [23], A.O. Polynev, I.V. Grishina, and S.A. Timonin use S.A. Ayvazyan's methodology applied to later data to calculate QOL indicators. Finally, in February 2019, RIA Rating Agency released a rating of Russian regions on the quality of life of the population[1]. The ratings are based on various methods based on the data on the Russian regions' socio-economic state for the period of 2014-2018. However, not all studies coincide in a set of regions, for example, the earlier ones do not have data on the Republic of Crimea and the city of Sevastopol. The classification results are summarized in *table 2*.

Table 2. Results of various classifications of the Russian Federation regions

RF Regions	Pareto	B.M. Grinchel		A.O. Polynev		RIA Rating	
	class (out of 10)	rating value	rank (out of 80)	rating value	rank (out of 80)	rating value	rank (out of 80)
Altai Krai	**7**	*6.8*	**60**	*6.8*	**62**	*6.9*	**68**
Amurskaya Oblast	**9**	*6.8*	**58**	*6.8*	**62**	*6.3*	**49**
Arkhangelsk Oblast	**7**	*7.8*	**73**	*6.5*	**52**	*7.1*	**70**
Astrakhan Oblast	**4**	*5.2*	**15**	*6.1*	**35**	*6.5*	**52**
Belgorod Oblast	**5**	*4.2*	**4**	*4.4*	**4**	*4.3*	**5**
Bryansk Oblast	**8**	*6.2*	**42**	*6.7*	**57**	*6.2*	**46**
Vladimir Oblast	**7**	*6.8*	**57**	*6.3*	**44**	*6.0*	**31**
Volgograd Oblast	**8**	*6.3*	**44**	*6.2*	**37**	*6.0*	**34**
Vologda Oblast	**9**	*7.9*	**75**	*6.7*	**57**	*6.7*	**58**
Voronezh Oblast	**5**	*4.6*	**6**	*5.8*	**26**	*4.7*	**7**
Moscow	**2**	*2.2*	**2**	*2.3*	**1**	*3.1*	**1**
Saint Petersburg	**4**	*2.1*	**1**	*3.0*	**2**	*3.2*	**2**
Jewish Autonomous Region	**9**	*8.1*	**79**	*7.1*	**70**	*7.7*	**73**
Zabaykalskiy Krai	**10**	*7.4*	**70**	*7.2*	**72**	*8.0*	**78**
Ivanovo Oblast	**9**	*6.4*	**49**	*6.4*	**48**	*6.2*	**45**

[1] *RIA Rating. The rating of the Russian regions by quality of life in 2018.* Available at: http://vid1.rian.ru/ig/ratings/life_2018.pdf

Continuation of table 2

RF Regions	Pareto	B.M. Grinchel		A.O. Polynev		RIA Rating	
	class (out of 10)	rating value	rank (out of 80)	rating value	rank (out of 80)	rating value	rank (out of 80)
Irkutsk Oblast	**7**	*7.9*	**77**	*6.6*	**56**	*6.8*	**63**
Kabardino-Balkarian Republic	**3**	*6.0*	**34**	*6.8*	**62**	*7.3*	**71**
Kaliningrad Oblast	**7**	*5.2*	**15**	*5.2*	**10**	*4.9*	**9**
Kaluga Oblast	**7**	*5.1*	**11**	*5.5*	**17**	*5.4*	**18**
Kamchatka Krai	**5**	*6.1*	**37**	*5.7*	**24**	*6.0*	**29**
Karachay-Cherkess Republic	**9**	*7.9*	**76**	*8.4*	**79**	*8.1*	**79**
Kemerovo Oblast	**5**	*8.0*	**78**	*5.8*	**28**	*6.4*	**50**
Kirov Oblast	**9**	*7.1*	**63**	*6.9*	**68**	*6.7*	**59**
Kostroma Oblast	**5**	*6.5*	**52**	*6.9*	**66**	*6.7*	**56**
Krasnodar Krai	**2**	*5.7*	**31**	*5.1*	**8**	*4.4*	**6**
Krasnoyarsk Oblast	**4**	*7.1*	**64**	*5.5*	**17**	*6.1*	**42**
Kurgan Oblast	**10**	*7.7*	**72**	*7.4*	**75**	*7.8*	**74**
Kursk Oblast	**6**	*4.8*	**8**	*5.6*	**20**	*5.2*	**13**
Leningrad Oblast	**2**	*6.5*	**50**	*5.2*	**12**	*5.0*	**10**
Lipetsk Oblast	**7**	*5.2*	**17**	*5.4*	**15**	*4.8*	**8**
Magadan Oblast	**6**	*5.6*	**23**	*5.5*	**19**	*6.0*	**32**
Moscow Oblast	**3**	*4.3*	**5**	*4.1*	**3**	*3.6*	**3**
Murmansk Oblast	**5**	*6.1*	**39**	*5.8*	**26**	*6.0*	**33**
Nizhegorod Oblast	**5**	*5.2*	**14**	*5.6*	**20**	*5.3*	**14**
Novgorod Oblast	**10**	*6.9*	**61**	*5.8*	**28**	*6.7*	**57**
Novosibirsk Oblast	**6**	*5.1*	**12**	*5.3*	**13**	*5.6*	**21**
Omsk Oblast	**7**	*5.6*	**23**	*6.2*	**37**	*6.6*	**53**
Orenburg Oblast	**5**	*6.6*	**53**	*6.3*	**44**	*6.0*	**30**
Oryol Oblast	**6**	*5.8*	**33**	*6.4*	**48**	*6.0*	**38**
Penza Oblast	**8**	*5.6*	**28**	*6.4*	**51**	*5.9*	**27**
Perm Krai	**4**	*6.4*	**48**	*6.2*	**37**	*6.1*	**39**
Primorski Krai	**7**	*7.0*	**62**	*6.6*	**54**	*6.2*	**47**
Pskov Oblast	**9**	*7.4*	**68**	*6.6*	**54**	*6.6*	**54**
Republic of Adygea	**5**	*6.5*	**51**	*5.9*	**32**	*5.9*	**28**
Altai Republic	**6**	*7.8*	**74**	*6.2*	**37**	*7.8*	**75**
Republic of Bashkortostan	**4**	*5.6*	**27**	*5.2*	**10**	*5.7*	**22**
Republic of Buryatia	**9**	*7.4*	**66**	*7.2*	**72**	*7.6*	**72**
Republic of Dagestan	**2**	*5.5*	**21**	*7.2*	**71**	*6.8*	**64**
Republic of Ingushetia	**3**	*5.6*	**23**	*7.6*	**76**	*7.8*	**77**
Republic of Kalmykia	**4**	*7.4*	**67**	*8.5*	**80**	*7.8*	**76**
Republic of Karelia	**10**	*7.4*	**69**	*6.2*	**37**	*7.1*	**69**
Komi Republic	**7**	*7.6*	**71**	*6.4*	**48**	*6.7*	**60**
Mari El Republic	**8**	*6.6*	**56**	*7.3*	**74**	*6.8*	**62**
Republic of Mordovia	**9**	*6.0*	**35**	*6.9*	**68**	*6.1*	**41**
Republic of Sakha (Yakutia)	**5**	*6.6*	**54**	*6.8*	**62**	*6.9*	**67**
Republic of North Ossetia – Alania	**5**	*4.7*	**7**	*6.2*	**37**	*6.7*	**61**
Republic of Tatarstan	**4**	*4.2*	**3**	*4.5*	**5**	*4.2*	**4**
Tyva Republic	**10**	*8.6*	**80**	*8.3*	**78**	*9.0*	**80**
Republic of Khakassia	**10**	*7.1*	**64**	*6.9*	**66**	*6.5*	**51**
Rostov Oblast	**3**	*6.2*	**40**	*6.1*	**33**	*5.3*	**17**
Ryazan Oblast	**7**	*5.7*	**29**	*6.1*	**33**	*5.8*	**23**
Samara Oblast	**6**	*5.6*	**22**	*5.0*	**7**	*5.3*	**16**
Saratov Oblast	**6**	*5.3*	**19**	*5.8*	**28**	*6.0*	**35**
Sakhalin Oblast	**5**	*5.3*	**20**	*5.6*	**20**	*6.1*	**43**

End of table 2

RF Regions	Pareto	B.M. Grinchel		A.O. Polynev		RIA Rating	
	class (out of 10)	rating value	rank (out of 80)	rating value	rank (out of 80)	rating value	rank (out of 80)
Sverdlovsk Oblast	**4**	*5.6*	**26**	*4.7*	**6**	*5.1*	**11**
Smolensk Oblast	**8**	*6.4*	**47**	*6.3*	**44**	*6.0*	**36**
Stavropol Krai	**2**	*5.8*	**32**	*5.8*	**28**	*5.5*	**19**
Tambov Oblast	**9**	*4.9*	**10**	*6.1*	**35**	*6.0*	**37**
Tver Oblast	**5**	*6.1*	**38**	*6.3*	**44**	*6.6*	**55**
Tomsk Oblast	**7**	*6.1*	**36**	*5.4*	**15**	*6.3*	**48**
Tula Oblast	**6**	*6.2*	**41**	*5.7*	**24**	*5.3*	**15**
Tyumen Oblast	**1**	*4.9*	**9**	*5.1*	**8**	*5.1*	**12**
Udmurt Republic	**6**	*6.3*	**43**	*6.7*	**57**	*6.1*	**40**
Ulyanovsk Oblast	**9**	*6.4*	**46**	*6.7*	**57**	*5.9*	**25**
Khabarovsk Krai	**5**	*6.3*	**45**	*6.2*	**37**	*5.9*	**26**
Chelyabinsk Oblast	**6**	*6.8*	**59**	*5.3*	**13**	*5.5*	**20**
Chechen Republic	**4**	*6.6*	**55**	*8.0*	**77**	*6.8*	**66**
Chuvash Republic	**8**	*5.2*	**17**	*6.7*	**57**	*6.1*	**44**
Chukotka Autonomous Okrug	**3**	*5.1*	**13**	*6.5*	**52**	*6.8*	**65**
Yaroslavl Oblast	**7**	*5.7*	**30**	*5.6*	**20**	*5.8*	**24**

The correlation matrix shows a very high consistency between the ratings of the Russian regions calculated according to the traditional methods (*Table 3*).

Table 3. Correlation matrix

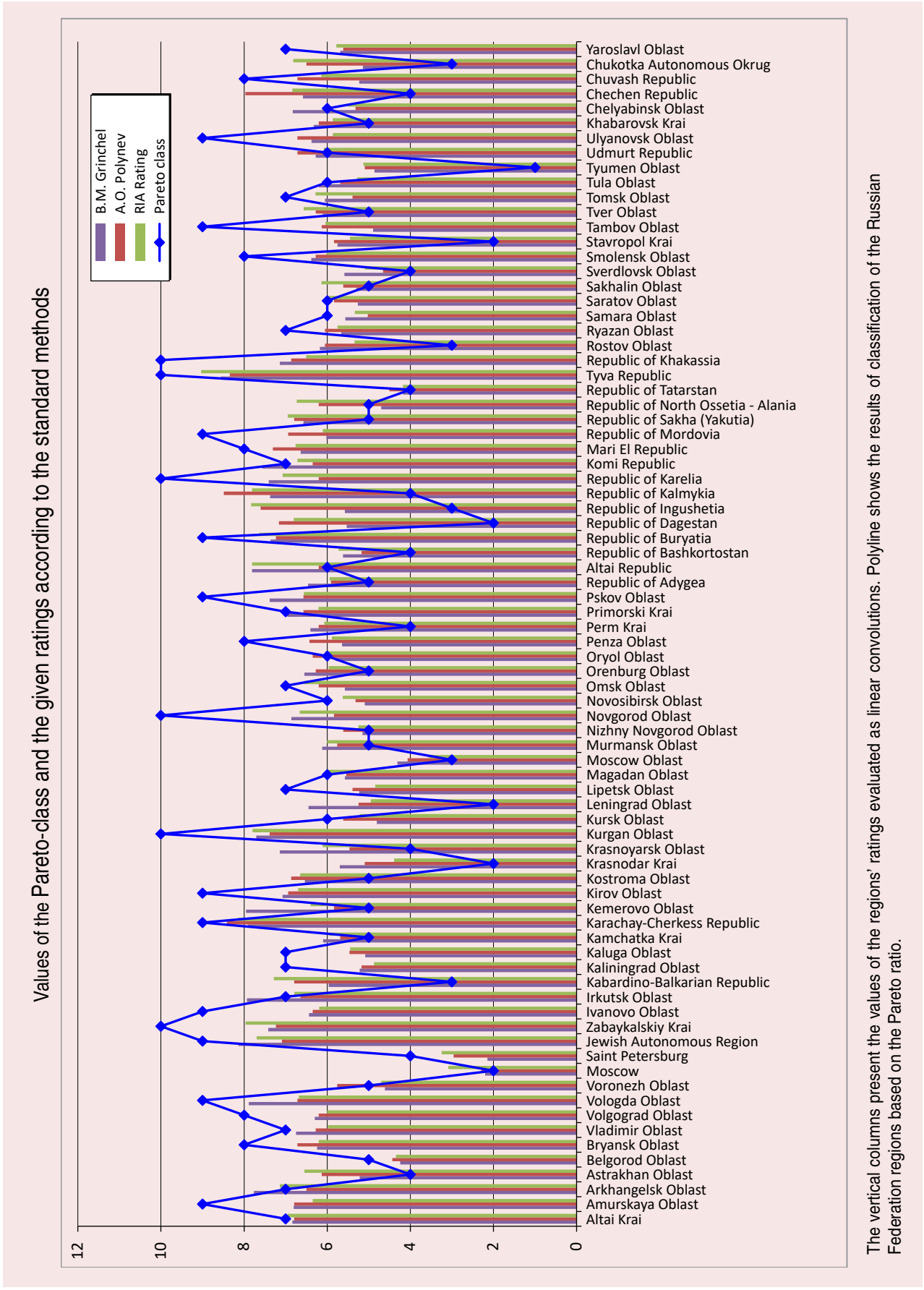
	Pareto class	B.M. Grinchel	A.O. Polynev	RIA Rating
Pareto class	1			
B.M. Grinchel	-0.51	1		
A.O. Polynev	-0.44	0.72	1	
RIA Rating	-0.46	0.78	0.88	1

The result of Pareto classification is slightly different from them. The correlation coefficient negative sign is easily explained: the smaller the Pareto class, the higher the quality of life index. Let us look at the differences in more detail. Since the results are obtained in different scales, we will bring the rating results to comparable values by linear shift, for perception convenience[2] (*Figure*).

It is apparent that having a very good consistency between the ratings evaluated by the generally accepted methodology, the Pareto classification generally agrees with them in terms of dynamics, and similar results were obtained for the vast majority of the regions.

However, the Pareto classification also led to uncharacteristic results. Thus, Moscow and the Tyumen Oblast, traditionally considered to be the leading regions, are located in different classes. The Tyumen Oblast outperforms the capital in terms of environmental indicators, but they are identical by other indicators. In this regard, the Tyumen Oblast fell into a higher Pareto class. Similarly, the difference between the Pareto classes of the Republic of Dagestan and the Republic of Ingushetia is explained. Despite the equality of results in the groups of "Socio-demographic indicators" and "Environmental indicators" and a slight (in absolute terms) superiority in other groups of variables there is a Pareto ratio between the

[2] Obtained as a result of least-squares estimate of Pareto classes on the corresponding rating. The tilt and shift have values of -0.11 and 11.2; -7.37 and 12.6; -0.1 and 10.6, respectively, for each rating being compared.


Values of the Pareto-class and the given ratings according to the standard methods
B.M. Grinchel
A.O. Polynev
RIA Rating
Pareto class
12
10
8
6
4
2
0
Yaroslavl Oblast
Chukotka Autonomous Okrug
Chuvash Republic
Chechen Republic
Chelyabinsk Oblast
Khabarovsk Krai
Ulyanovsk Oblast
Udmurt Republic
Tyumen Oblast
Tula Oblast
Tomsk Oblast
Tver Oblast
Tambov Oblast
Stavropol Krai
Smolensk Oblast
Sverdlovsk Oblast
Sakhalin Oblast
Saratov Oblast
Samara Oblast
Ryazan Oblast
Rostov Oblast
Republic of Khakassia
Tyva Republic
Republic of Tatarstan
Republic of North Ossetia - Alania
Republic of Sakha (Yakutia)
Republic of Mordovia
Mari El Republic
Komi Republic
Republic of Karelia
Republic of Kalmykia
Republic of Ingushetia
Republic of Dagestan
Republic of Buryatia
Republic of Bashkortostan
Altai Republic
Republic of Adygea
Pskov Oblast
Primorski Krai
Perm Krai
Penza Oblast
Oryol Oblast
Orenburg Oblast
Omsk Oblast
Novosibirsk Oblast
Novgorod Oblast
Nizhny Novgorod Oblast
Murmansk Oblast
Moscow Oblast
Magadan Oblast
Lipetsk Oblast
Leningrad Oblast
Kursk Oblast
Kurgan Oblast
Krasnoyarsk Oblast
Krasnodar Krai
Kostroma Oblast
Kirov Oblast
Kemerovo Oblast
Karachay-Cherkess Republic
Kamchatka Krai
Kaluga Oblast
Kaliningrad Oblast
Kabardino-Balkarian Republic
Irkutsk Oblast
Ivanovo Oblast
Zabaykalskiy Krai
Jewish Autonomous Region
Saint Petersburg
Moscow
Voronezh Oblast
Vologda Oblast
Volgograd Oblast
Vladimir Oblast
Bryansk Oblast
Belgorod Oblast
Astrakhan Oblast
Arkhangelsk Oblast
Amurskaya Oblast
Altai Krai
The vertical columns present the values of the regions' ratings evaluated as linear convolutions. Polyline shows the results of classification of the Russian Federation regions based on the Pareto ratio.

republics determining the difference in the classes of regions. The Caucasian republics of Dagestan, Ingushetia, and Kabardino-Balkaria took a relatively high place in the rating: having a high class in the groups of "Socio-demographic variables" and "Environmental variables", they have only one or two levels of Pareto-dominant regions.

The practical significance of the research consists in the possibility of using Pareto classification algorithms as a way to work with ordinal data, as well as a way to obtain numerical characteristics in a situation where only the order relation is known by some features. The classification approach based on the Pareto ratio can also be used in making management decisions, since, unlike, for example, neural networks, not only the result is known, but also the information about the causes of this class is stored, in particular, which group of variables contributed to getting into a lower class and, accordingly, which area should be given additional attention.

To sum up, we can conclude that, despite a fundamentally different approach applied, the results of Pareto classification of the Russian regions are generally consistent with the results of traditional ratings, and they have undeniable advantages. Thus, the proposed method is able to work successfully with the data measured in ordinal scales (i.e., only considering the information about who is better in each pair by the selected indicator), without using absolute values. The main operation used is binary multiplication, so the algorithm execution speed is high enough even in case of outdated computers. We should also note that Pareto classification is not a common method, its algorithm does not have a built-in implementation in any of the data processing packages known to the author, which in turn prevents its wide distribution.

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Moral Aspect of Young People's Subjective Competitiveness*

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Abstract. The issues of competitiveness and competitive relationships are usually considered from an economic point of view, bypassing socio-cultural aspects. The paper presents a sociological analysis of young people's competitive and moral orientations. The consideration of the emphasized problem field allows us to determine the connotation of competitive relationships, from positive ("ethical" competition) to negative ("aggressive", "predatory" competition). The authors assess the format of competitive relationships set up by the younger generation considering themselves competitive, and those young people who reject their own involvement in competition in any form. A new scientific result, the understanding of competitiveness as a subjective phenomenon is obtained. The author's system of empirical indicators for evaluating subjective competitiveness is also an element of scientific novelty. The presented material is aimed at achieving a specific goal to determine the relationship between the young people's subjective

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competitiveness and their desire to adhere to stable value standards and high moral principles in behavior. The following tasks are solved within the framework of the research: the key characteristics of competition as a socio-cultural phenomenon are identified; young people's attitude to competitiveness is studied; the relationship between competitive orientations, individual responsibility for their own actions, locus of control, trust and respect for others, readiness to help others is revealed. The empirical basis of the sociological research was the data from a questionnaire survey of young people in the Tyumen Oblast (2017, 3403 people, including 1087 high school students; 1360 students; 956 working young people under 30). It is found that the respondents not considering themselves competitive characterize competitive interaction with more negative ratings than young people who are actually involved in competition. Young people with low competitive orientations demonstrate a lack of active life position, they are not ready to create their own business and take responsibility for their lives. The highest percentage of competitive respondents is found among working youth. The author analyzes the world outlook, the general culture of high school students, students and working youth, the relationship between their competencies and competitiveness. Worldview attitudes, values, and moral guidelines are identified as the key determinants shaping young people's competitiveness. It is concluded that competitive youth tend to adhere to high moral principles.

Key words: high school student, student, student youth, working young people, competition, culture of competitive relationships, competitiveness, morality, value orientations.

Introduction

At the end of 2017, the President of the Russian Federation signed a decree[1] that prioritized the development of competition in Russia. However, competition in it is treated exclusively from an economic point of view, while its implementation is possible only due to the high level of human capital development in the country, as well as in a specific industry, at the enterprise. Competition is carried out by people who are competitive on a personal level. Investment of resources in the development of individual competitiveness becomes a strategically important task that is solved comprehensively, involving social institutions such as family, education (at all its levels, including informal and self-education), economy, culture, etc. Human capital development not only generates multiple economic profit (which can be calculated), but also contributes to a significant socio-cultural return (almost immeasurable)[2].

Competitive relations are manifested in all spheres of life without exception, from biological and social to economic. Competition acquires a special content in each of them, while its key aspect, the struggle for **leadership** in the possession of limited resources, remains unchanged. In the social aspect, competition is under-stood as *"a contest between one and other agencies – whether people, institutions or nations – for individual advantage"* [1, p. 176].

There are many definitions of the term "competition" and its derivatives. The analysis of the terminology pool was carried out in early publications of our research team [2]. In the process of competitive interactions, individuals enter into social relationships,

[1] Decree of the President of the Russian Federation no. 618 *"On the main directions of state policy of competition development"*, dated 21.12.2017.

[2] *Human development report*. Available at: http://hdr.undp.org/sites/default/files/HDR2016_RU_Overview_Web.pdf

its effectiveness (along with the availability of knowledge, skills and professional competences) is influenced by past experience of such relationships. The competitiveness of a modern specialist becomes *non-linear* and "implies non-standard thinking and actions, avoiding patterns in solving problems, searching for new algorithms in a crisis situation, etc."[3].

In the framework of this research, competitiveness is interpreted as *"a complex property inherent in a person and consisting of psychophysical resources (health, age, appearance, level of intelligence) and moral aspects (value orientations and their hierarchy, beliefs and their system, personal prohibitions and restrictions). The basis of this property is high professionalism, individual's psychological readiness to compete for one's existence and his or her social characteristics"* [3].

Effective functioning of social institutions and social structures depends on the compliance with a set of **value** norms and rules. Each social community, trying to be equal to the norms and values accepted in a particular society, transforms them in accordance with the peculiarity of its activity, then transmits them to the current generation, which in turn transmits them to the next ones. The relevance of compliance with a set of moral norms in social life is associated with the synchronization of social behavior in a particular society, the definition of acceptable (socially approved) strategies and unacceptable (reprehensible) actions.

Literature review

People's worldview is determined by life their values, which are interpreted as stable beliefs about the preferred behavior strategies or final states in a hierarchical order [4, p. 5]. R. Inglehart identified the level of economic development of the country where a person lives, as well as the prevailing culture in which his or her socialization took place, as the key factors that form individual's values [5].

In general, life values are a basic set of motivations that form a normative series in the minds of various social groups representatives and determine human behavior. The permanent transformation of basic values taking place in society leaves an imprint on behavioral ethics. There are two polar ethics of behavior that can be distinguished: *"within the paradigm of neoliberal globalization, egoistic strategy (competition, efficiency, personal success) prevails; within the paradigm of sustainable development theses are solidarity, justice, responsibility for the future"* [6, p. 67].

In the process of socialization, an individual learns certain **cultural codes** that form a system of subjective coordinates, in which the individual's life activity subsequently takes place [7]. As noted by A.M. Klimenkova, "cultural codes are formed on the basis of a system of precedent phenomena that are "rooted" in a certain cultural space, and there are facts of their widespread use in a certain culture" [8, p. 8]. Cultural code is the basis for the emergence of value orientations. Learned and realized values become the basis for the formation of personal culture, a significant aspect of its self-determination. *"The core of the value structure is an ideal, a sociopolitical and moral image of the desired future. Value orientations, considered by a person as a standard, somehow agree with the ideal, forming their own hierarchy of life goals and values, means or ideas about the norms of behavior"* [9, p. 331].

[3] Goncharova E.P., Krotikova Yu.S. *Graduate students' anxiety.* Available at: http://elib.bsu.by/bitstream/123456789/192352/1/Гончарова_Кротикова_ВШ_18_ч.1-206-210.pdf

International comparative studies include the *World values survey (R. Inglehart technique), World Values Survey*[4]*, Eurobarometer*[5]*, European Social Survey*[6]*, and the European Social Survey (Sh. Schwartz technique)*.

The basic theory of values is developed by the classics of sociology, E. Durkheim, T. Parsons, M. Weber, W. Thomas and F. Znaniecki. The term "value" is interpreted as a reference point that sets the semantic horizons of a person's social behavior. Value and moral orientations of competitive relations participants is of particular scientific interest to sociologists, psychologists, teachers and representatives of other social and humanitarian sciences. Success in competition is stereotypically perceived in an individual, unipersonal continuum, but not in terms of the "**win-win**" strategy (where both parts win). This can be partially explained by the fact that the modern person's values are largely "economized".

The works of economists A. Marshall, A. Smith, and J. Keynes describe the theory of "economic man" *(Homo Economicus)*, whose priority activity is aimed at obtaining income or other benefits [10]. Modern research emphasizes that Homo Economicus gives way to Homo Reciprocans, a collective being focused on socially significant values and endowed with the idea of responsibility, free will in the conditions of observing the fine line between altruistic and egoistic motivation. Competitive relations are also changing, despite the continued desire for individual profit and the capture of limited resources, the rejection of aggressive competition, orientation to strategies of long-term interaction and social responsibility are socially encouraged.

In the new paradigm of competitive relations, altruistic values are basic for making economic decisions and performing socially significant interactions. "*Value orientations designed to form a system of economic motivation of individuals as members of society concerned with the idea of justice in relation to all manifestations of life on Earth are brought to the foreground"* [11, p. 82]. The processes of social justice criteria formation within the framework of pro-social behavior are implemented (*"cooperative behavior, ideas about what is good and what is bad, compliance with social norms"* [12, p. 112]). The work of B. Schneider, J. Benenson, M. Fülöp, M.Berkics and M. Sándor [13] is also devoted to the problems of cooperation and competition; it examines the methodological issues of studying cooperation and competition and cultural differences in their implementation.

In situations of moral choice, a person adheres to various behavioral models studied within the framework of game theory. One of the experiments aimed at identifying the priority strategy of an individual (Homo Economicus or Homo Reciprocans) is "Contribution to the common good" game (a variant of "Social dilemma"): if a person adheres to individual interests in a group interaction, when others indicate the priority of common interests, then his or her benefits will exceed the benefits of other participants; if this strategy (priority of personal interests) is followed by everyone, then everyone's gain will be less than if everyone were pursuing common interests. The idea of justice as a basis for cooperation was studied in "Ultimatum game" experiment (V. Guto, R. Schmittberg, B. Schwartz, 1982) [14]. To achieve their own goals, the participants of

[4] *World Values Survey*. Available at: http://www.worldvaluessurvey.org

[5] *EUROPEAN COMMISSION. Public Opinion*. Available at: http://www.ec.europa.eu/commfrontoffice/publicopinion/index.cfm

[6] *European Social Survey*. Available at: http://www.ess-ru.ru

the competitive interactions often use means differentiated "both by the degree of economic rationality for a particular situation, and by the degree of morality and ethical normativity" [15, p. 234].

Let us formulate our research question as concretely as possible: which competitive strategy becomes more profitable – to cooperate and build long-term relationships, or "to stick at nothing" and get short-term gains "burning bridges". To answer the question, let's turn to the definition of the ideal model of the personality of the XXI century, according to V.I. Andreev, it is a multidimensional personality that absorbs and implements the advantages of a creatively self-developing, self-sufficient and competitive personality. "Self-sufficient" refers to *"a person whose system-forming qualities are autonomy and independence, a high level of moral culture and citizenship, as well as high abilities for self-determination and self-restraint, combined with a sufficiently high level of creative potential and healthy practicality"* [16].

The formation of personality's culture in the context of participation in competitive relations becomes strategically important. Competitive interactions are defined as *"interaction of subjects of economic relations in a competitive market; unity of influences and joint actions of subjects of competition aimed at achieving mutually intersecting goals"*[7]. In turn, the culture of competitive relations is *"a personal quality that integrates value orientations, attitudes, knowledge, ways of behavior, communication and activity of the individual, ensuring effective cooperation and competition in a competitive environment and focused on achieving economic goals by rational and ethically acceptable means"* [17, p. 169]. The culture of competitive relations determines the ability of an individual to participate in competition not only in economically feasible, but also in morally justified ways[8].

R.D. Hayward and M. Kemmelmeier studied the structural and cultural roots of such relationships in different societies, having proved different views on competition: "it is a basis of social order" or "it destroys positive social connections" [18].

However, "the culture of competitive interactions can be characterized by one of the following types and levels: anti-culture (negative level), cultural vacuum (zero level) and actually, the culture of competitive interactions (low, medium, high level)" [19, p. 226]. The results of the experiment conducted by S.E. Motornaya among the students indicated a high level of competition and proneness to conflict [20, p. 289].

Specialist's competitiveness "depends on both professionalism, competence, and the compliance of personal qualities with the requirements of the profession. These qualities include character traits, abilities, and a number of other person's psychological characteristics" [21, p. 567]. "The ability to acquire competitive advantages is provided by the presence of certain internal resources and potentials: intellectual, operational, moral-volitional, psychological, etc." [21, p. 568]. "Specialist's competitiveness determinants are not only socially and professionally significant personal qualities, but also competence, personality's orientation, value orientations and target settings, etc." [22, p. 145].

[7] Il'ina V.N. *Konkurencija* [Competition]. Available at: http://be5.biz/ekonomika/k005/29.htm

[8] Hazova S.A. *Razvitie konkurentosposobnoj lichnosti v sisteme obrazovanija: avtoref. dis. ... d-ra ped. nauk.* [Development of a competitive personality in the education system: Doctor of Sciences (Pedagogics) dissertation abstract]. Majkop, 2011. 60 p.

The ideas significant in the context of this paper were expressed at the end of the XIX century by the classic sociologist C.H. Cooley in the book "Personal competition" [23], where the trend of increasing individualism and population's competitiveness is noted on the example of the US residents. The moral standards that a person applies to his or her behavior are an individualized reflection of the social environment, social community, or group within which they interact. Each social group controls its members and imposes a requirement on them to meet certain standards of behavior, otherwise the subjects are sanctioned or excluded from the group. Achieving success in each career strategy (*vertical, horizontal, or zigzag-shaped*) is associated with certain standards that are specific to a certain practice of social interaction. *"The higher, from a moral point of view, the activity of a social group is, the more moral the conditions for achieving success in it are, and vice versa. In a criminal organization, crime becomes a condition for success; while there are professions where honesty is the best practice for achieving success"* [23]. Dishonesty can become an optimal competitive strategy in the conditions of anomie (E. Durkheim), when there is a demoralization of social interactions, in which there is unfair competition and immoral actions prevail over honest and moral ones. In this context, C.H. Cooley emphasized that *"unstable and dishonest people are like crumbling bricks from which a stable social structure cannot be built <...> A successful person is always moral or fair"* [23].

Based on the analysis of the works of domestic and foreign scientists, we shall focus the research interest on the value orientations and moral priorities of the youth. Special relevance of considering the system of value coordinates on the example of this socio-demographic group is explained by several factors. First, the formation of young people's stable value orientations occurs in the process of primary and secondary socialization, it sets the basic principles making possible further implementation at work and in everyday life. Secondly, young people transmit their priority values and moral attitudes to the next generations, forming the society's cultural code.

In the world, the number of people aged from 10 to 24 years old is 1.8 billion people (25% of the world's population)[9]. In Russia, this age group makes up 21.9 million people, or 14.9% of the total population of the country (at the beginning of 2019). Based on the accepted borders of youth age in this country (from 14 to 30 years), 24.2 million people (16.5%) belong to youth[10].

Research materials and methods

The empirical base of the study consists of the data from the fundamental research work *"Formation of young people's competitive orientation and competitiveness in Russian society in the context of modern socio-cultural dynamics"*, conducted among high school students, students and working youth by the team of the Tyumen State University's sociological laboratory in April-May 2017. The research method is a questionnaire survey. The sample consisted of 3403 respondents aged from 14 to 30. Sample type is multi-stage, zoned, quota proportional.

The students of grades 10-11 of educational institutions of the Tyumen Oblast were interviewed: Tyumen (N = 607), Tobolsk (N = 158), Ishim (N = 87), rural area (N = 253).

[9] *World population in 2014.* Available at: https://www.unfpa.org/sites/default/files/pub-pdf/RU-SWOP14-Report%20Rev-Web-update%2024%20Nov.pdf

[10] Distribution of the population by age groups. *Official website of the Federal State Statistics Service*. Available at: http://www.gks.ru/free_doc/new_site/population/demo/demo14.xls

The field stage of the sociological research among students of higher (N = 1146) and secondary (N = 214) vocational education institutions was conducted in the cities of Tyumen (N = 963), Tobolsk (N =135), Ishim (N = 98). In addition, the sample included students participating in the all-Russian meeting of the best groups (N = 164).

The survey also involved the working youth from 20 organizations of the main sectors of the economy in the cities of Tyumen, Tobolsk, Ishim and rural areas of the Tyumen Oblast (N = 956). The empirical data analysis was performed using the IBM SPSS Statistics program (license package, version 23).

The research hypothesis was based on the following assumption, *"competitive youth tend to adhere to stable moral principles in their behavior"*, which is revealed in the following: young people who do not consider themselves competitive, characterize competitive relations more critically and biased, providing them with negative connotations, than young people who successfully demonstrate themselves in competition.

Research result

The main idea of the study was to develop *three* forms of questionnaire survey including a set of questions aimed at determining young people's subjective competitiveness (by the example of high school students, students and working youth) and the specifics of competitiveness formation in each of the designated social groups. If at the age high school students this is the establishment of common principles of competition and competitive relations, willingness to be successful (full competitive orientation cannot be yet discussed), the students' readiness for competition (competitiveness) is increasing rapidly, young people aware that a future employer is interested in competent, highly qualified staff and that they will have to compete for the best place in the labor market. Accordingly, if young people take certain actions to strategically accumulate competitive potential during their training already, they will become more competitive workers at their future work. For the working youth, the priorities of social and professional competitiveness are significantly transformed, the accumulation of competitive potential (professional development, self-education), as well as the further maintenance of competitive stability remains relevant. In modern conditions, it is almost impossible to be competitive at the local level, and competitive standards are becoming global in each profession. A person can function even without being competitive, but the socio-professional success of such functioning is very doubtful.

The structure of the presented analytical material is due to the research logic aimed at assessing the respondents' attitude to competition as it is, and the list of personal qualities of team members and the competitive person in particular; the definition of "taboo" for unethical behavior in competition; the designation of values of public recognition of the achievements for a person and aspirations to be successful; identifying the relationship between openness to the world (in the realm of social environment), the willingness to cooperate and trust to others. Let us consistently reveal the planned research tasks.

When analyzing the respondents' answers, we compared the level of subjective competitiveness inherent in the designated youth groups with other aspects studied. The methodological validity of this approach is proved by a research team led by academician of the Russian Academy of Sciences M.K. Gorshkov by means of the self-assessment method as one of the four indicators of a person's position in the social structure [24].

The questionnaire for students and working youth includes a question about self-assessment of competitiveness in the following wording: "Do you consider yourself competitive?" *(table 1)*. Combining polar statements in the dichotomy "I consider myself competitive" (*answer options "yes", "rather yes than no")* and "I do not consider myself competitive" *("rather no than yes" and "no"*), it is clear that the minimum level of subjective competitiveness is recorded among schoolchildren (80%, slightly higher among high school students of the elite gymnasium of the Tyumen State University – 87%), while increasing among students (84%). Working youth, who are at the initial stages of their career path, show their own competitive strategies to the maximum extent (90%; among those with higher education – 93%).

The highest percentage of respondents who consider themselves competitive (the answer options are "yes" and "rather yes") is recorded in the Tyumen State University gymnasium (87%), among students of other schools that we have classified as "elite", it is 79%, in ordinary comprehensive schools it is 77%.

The distribution of the responses by gender shows that among high school students, boys are more likely to describe themselves as competitive (86%, only 75% of girls). There are differences in self-assessment of competitiveness depending on the level of academic performance. The respondents were asked the question "How do you do in school?" (answer options were "excellent", "good and excellent", "good and satisfactory", "mostly satisfactory"). Excellent students consider themselves competitive in 94% of cases, those who get As and Bs are 85%, and those who get Cs are 58%. It is difficult to understand the root cause of this without an in-depth analysis; a student does not consider himself or herself competitive, successful, and therefore does not study well, getting low grades, or, being unable / not motivated to learn better, he or she evaluates his or her level of competitiveness as low. This aspect deserves a separate detailed study.

Let us turn to the respondents' assessment of competition as a socio-cultural phenomenon that is realized in the course of competitive relations. 87% of respondents among the competitive working youth, agreed with the statement *"Competition is good; it encourages people to work hard and develop new ideas",* and only 71% among the non–competitive youth. Spearman's correlation coefficient

Table 1. Young people's self-assessment of their competitiveness, % of the respondents' number

Do you consider yourself competitive?		Yes	Rather yes than no	Rather no than yes	No
High school students	comprehensive schools (city) (город) (N = 272)	29.5	47.8	18.7	4.1
	comprehensive schools (rural areas) (N = 235)	23.4	53.7	19.9	3.0
	gymnasiums or specialized schools ("elite schools") (N = 320)	32.5	46.7	17.0	3.8
	Tyumen State University gymnasium (N = 260)	31.1	56.0	12.1	0.8
	average (N = 1087)	29.5	50.7	16.9	3.0
Students	institutions of secondary vocational education (N = 214)	32.7	54.3	10.6	2.4
	institutions of higher education (N = 979)	22.5	61.4	13.1	2.9
	average (N = 1360)	25.7	58.6	13.1	2.6
Working youth	graduated from secondary vocational education institutions (N = 219)	52.8	26.6	12.4	8.3
	graduated from higher education institutions (N = 656)	58.8	34.5	5.1	1.7
	average (N = 956)	57.3	32.5	6.9	3.3
Note: percentages are calculated by line.					

between the variables was 0.110** (very weak, direct correlation; here and further "**" means $p < 0.001$). The absolute majority of respondents with higher and postgraduate education have a positive opinion about competition (89%), while there are only three quarters of such respondents among those with incomplete higher or secondary professional education (78%).

To analyze the studied phenomenon, the respondents were asked to evaluate their attitude to competition using the semantic differential method *(table 2)*. The question is included in the questionnaire only for working young people because of their higher subjective competitiveness and intense involvement in competitive relationships within the framework of labor and interpersonal interactions; the formed concept of competition, repeatedly edited by the practice of real interactions.

Competitive respondents more often than their non-competitive colleagues described competition as "effective" (86% vs. 70%), "necessary" (88% and 76%), "fair" (48% and 32%) and "obvious" (62% and 48%). At the same time, there is a more positive attitude to competition among the respondents with higher and postgraduate education (let us remember that they have a higher level of competitiveness among their peers). In their opinion, competition is "necessary" (90% vs. 80% among young people with incomplete higher or secondary vocational education), "useful" (92% and 85%). The dependence of variables included in the semantic differential (Spearman correlation) is observed between the respondents' competitiveness and the following characteristics that they give to competition: "useful" (0.159**), "effective" (0.169**), "necessary" (0.156**), "moral" (0.116**), "obvious" (0.102**) (very weak, direct correlation).

Assessment of young people's personal characteristics

In this thematic section, we will consider the significance of such a personal characteristic as "competitiveness" for the respondents, their assessment of classmates, and analyze the qualities inherent in a competitive personality.

Let us reveal the attitude to competitiveness of the youngest cohort of the identified social group, i.e. high school students. 68% of competitive schoolchildren agreed with the statement *"Competitiveness (success) is an important quality of a person in modern Russian society"* (the answer option "yes"), and their non-competitive peers agreed with it one and a half times less often (43%).

Table 2. Distribution of responses of the working youth to the question "Assess the concept of "competition" according to the following criteria", % of the respondents' number (N = 956 people)

Answer options	Competition		Education level	
	Yes, rather yes, than no	rather no, than yes, no	secondary professional and lower	higher and postgraduate
Useful	90.7	81.5	85.2	91.9
Fair	51.3	41.5	47.4	51.5
Profitable	66.4	63.4	64.1	67.4
Effective	85.8	70.4	79.0	86.5
Necessary	87.8	75.7	80.3	89.6
Pleasant	44.3	43.7	45.0	44.1
Moral	48.4	44.9	47.2	48.3
Comfortable	41.2	41.7	39.8	42.6
Honest	48.3	32.4	44.8	47.7
Obvious	62.1	47.7	59.3	61.7

Priority of competitiveness among personal qualities is recognized by 74% of the students of the TSU gymnasium, 64% of respondents from schools classified as the "elite" ones, and only 56% of respondents in ordinary schools. 66% of tenth grade students agreed with the statement about the priority of competitiveness, and slightly less than 59% among eleventh–graders. The *priority* of competitiveness is recognized by the most successfully studying high school students (79% answered "yes"), 64% of B students, and 54% of C students. The higher one's own orientation to success in competitive interactions, the higher significance to competitiveness as a characteristic of an individual is assigned. Differences in the responses of respondents by gender are statistically insignificant.

A person sees the world through a certain prism formed as a result of socio-cultural experience, internalized values and norms. The question about the priority qualities that classmates possess is included in the questionnaire form for high school students. On average, personal characteristics with negative connotations (*malevolence, selfishness, passivity and indifference, irresponsibility*) were more often noted by uncompetitive respondents in relation to their classmates (the range between the responses of uncompetitive and competitive respondents was on average 9%) (*table 3*). Competitive respondents mainly characterized their peers by noting their positive traits (*conscientiousness; hard work; social activity; mutual assistance and supportiveness*) (the range between the responses of competitive and non-competitive respondents was on average 13%).

The student youth questionnaire includes a series of open questions: *"What does it mean to you to be competitive in life in general?", "What does it mean to you to be competitive in the labor market?"* and *"What qualities do people need to be competitive?"*. The analysis revealed some competitive strategies and stereotypes of the respondents' perception of competitiveness as a social phenomenon. In the first approximation, the respondents (based on their answers) can be divided into those who compete in good faith and those who do not shun unfair competition and, if necessary, are ready for unethical actions, unjustified risk, and even can break the law. Thus, about 7% of students characterized a competitive personality mainly through negative qualities. Among the qualities that are necessary for success in competition, they called ambition, arrogance, stubbornness, cunning and the ability to achieve goals at any cost. At the same time, the respondents admitted the possibility of taking the desired position (even

Table 3. Distribution of high school students' responses to the question "What qualities do your classmates have?" (the sum of the answer options "very common", "quite common") depending on the level of competitiveness, % of the respondents' number (N = 1087 people)

Answer options		Do you consider yourself competitive?	
		Yes and rather yes	Rather no and no
Negative	Malevolence	12.9	16.8
	Selfishness	28.0	36.9
	Passivity and indifference	27.7	37.6
	Irresponsibility	30.5	43.4
Positive	Conscientiousness	78.4	65.6
	Hard work	72.9	54.2
	Social activity	75.8	65.3
	Mutual assistance and supportiveness	86.1	76.3

resorting to unfair methods), taking it away from the opponent. Those respondents who do not consider themselves competitive were more likely to endow a competitive person with negative traits.

If the list of a person's competitive qualities is formed on a stable value basis, it is highly likely that the subject displays ethical behavior in competitive interaction. Let us consider the value orientations associated with competitive relations (*quite real in the case of working youth, and planned in the case of students*). Let us start the analysis in order of increasing intensity of competition orientation, considering the assessment of high school students and students, moving on to the implementation of the formed competitiveness of the working youth in the workplace and in life in general.

Let us analyze the formation and stability of value orientations of the working youth. The questionnaire includes the following statement *"In our time, funds do not matter to win over competitors, the result is important"*. Every third respondent found it difficult to answer the proposed question (33%), and 32% of the competitive respondents and 25% of the non-competitive ones expressed their disagreement with the statement. Among young people with incomplete higher, secondary professional and lower levels of education, a quarter of respondents (25%) expressed disagreement with the proposed statement, and one in three with higher and postgraduate education (34%). Accordingly, being "strong" in a specific social and labor sphere, they are aware of social and moral responsibility for their actions and their consequences.

The conclusion is confirmed by the following results: 42% of competitive working young people and 50% of the non-competitive ones agreed with the statement *"The modern world is cruel, you need to fight for your place in it, and even go over some norms of morality, in order to survive and succeed"*. The statement "We live in a different world today; many moral norms are outdated already" is most closely related to the uncompetitive working youth (64% vs. 43% of competitive respondents).

It is the competitive working youth who in 33% of cases agreed with the statement *"People can only get rich at the expense of others"* (23% of non-competitive). After examining the responses in this category related to the questionnaire, we believe that it is not about a "parasitical" strategy and selfish use of other people for own benefit, but about their involvement in the implementation of the project or solving a common problem, the manifestation of leadership for the association of "isolated" people into a single team to develop each in a good cause.

Responsibility and locus of control

The process of social and professional competitiveness formation is quite long. It can be assumed that the respondents focused on getting a social "win" in the short term have less strict moral standards than their peers who are focused on long-term competitive strategies. Are the representatives of the younger generation willing to invest time and effort in a long and patient work on a task, or would they prefer a short-term win? 77% of competitive respondents among the working youth agree with the statement *"At the end of the day, hard work is rewarded"* (59% of non-competitive respondents share a similar view), which shows their desire for long-term goal setting.

However, competitive respondents are more likely to demonstrate an external locus of control. 20% of competitive and 36% of non-competitive respondents agreed with the statement *"Person's life is much more determined*

by circumstances than by their own efforts", which indicates their active life position and lack of desire to shift the blame for possible failure to other people or social institutions.

Trusting other people and expecting support from family and friends

Competitive respondents are more likely to demonstrate their capabilities to others: 52% of high school students (and 37% of their uncompetitive peers), 47% of students (37%). There is a very weak direct correlation between the indicated variables among high school students (Spearman = 0.194**) and students (Spearman = 0.118**). Among high school students who consider themselves competitive, the desire to be successful and get recognition of their achievements by others is much higher (60% vs. 40% of non-competitive students); only 8% of competitive and 20% of non-competitive respondents are not focused on this goal. There was a weak direct correlation (Spearman = 0.251**). In schools classified as "elite" ones, this desire is relatively higher (63%) than in ordinary comprehensive schools (47%). Among tenth grade students it is 10-60%, by the eleventh grade there is a decrease to 52%. Success and recognition are more valuable for successful students (62%) than for C students (43%).

Competitive high school students demonstrate a higher level of trust to other people. When answering the question *"Do you think most people around you can be trusted or should you be careful with them?"* the vast majority of respondents (among all categories) adhere to the *"be careful"* strategy. Despite the widespread attitude of distrust, it is high school students who show the highest degree of trust, 17% of competitive and 10% of non-competitive respondents tend to trust people. The trend persists among the students (19% and 13%, respectively), but it fades away among the working youth (10% and 8%). Thus, we see two different strategies, students who consider themselves competitive are more likely to show confidence in others than their non-competitive peers. The share of those who are pre-oriented to distrust others is higher among the working youth (61% of competitive young people and 56% of non-competitive ones), and the maximum number of respondents who do not have a standard strategy when making a decision to "trust" or "not to trust", they act depending on the specific situation.

Continuing to study trust, it is important to consider the aspect of mutual assistance expected by the respondents (the question *"How many friends and acquaintances of yours are ready to provide you with urgent assistance if necessary?"*). Undoubtedly, mutual assistance is possible only in the case of pre-established favorable relationships, also based on trust between actors. Strong social ties that a person has established and maintains give him or her social stability and the ability to rely on the help of certain people if necessary. Competitive respondents generally noted a larger number of people whose support and assistance they can count on if necessary: 25% of competitive high school students and 22% of competitive students named from four to six people. W.O. Busse and J.M. Birk found a similar relationship between competitiveness, trust to others and the closeness of friendship in 1993 already [25].

Competitive respondents are also more likely to rely on help and assistance from seven or more people in a difficult life situation – 18% of school children and 12% of students, which is on average twice as high as the share of their non-competitive peers' similar responses. The respondents who are not involved in competitive interactions are mainly focused on maintaining relationships with a narrow circle of selected people (usually family members),

and 67% of them expect help from no more than three people, and in 7% of cases they have no one to rely on. The respondents focused on success and competition are relatively less likely to value friendship and do not often expect it to last a lifetime. 49% of competitive respondents and 64% of the uncompetitive ones agree with the phrase *"Friends are spiritually close people, faithful to each other forever"*.

Respect for others and willingness to come to rescue can be assessed through the following statements: *"Every person should be treated with respect, his or her opinion should be listen to"* (91% of competitive working young people and 75% of the uncompetitive ones agreed with the statement) and *"A moral, conscientious person should help people, even if he or she has to sacrifice his or her comfort"* (46 and 41%).

Conclusion

The authors of the paper analyzed competitiveness as a subjective phenomenon that is reflected in a person's consciousness in the form of ideas about his or her own success in the modern world. We should note that subjective competitiveness is based primarily on a person's perception of certain competitive advantages he or she has, which is important for self-esteem formation, and therefore the realization of the internal potential. Competition becomes a significant characteristic for successful modern social interactions.

On the basis of the conducted analysis it is possible to make **five conclusions**:

– *first*, young people who feel their own competitiveness are less likely to give up generally accepted moral norms in favor of spontaneous benefits compared to their non-competitive peers and are willing to invest time and effort in a long and patient work on a task, giving up the momentary gain of an unclear moral etiology. Achieving competitiveness is a very long process, and the respondents who have already had experience of long-term investment of time and effort in planning (career and other areas of life) do not aim for a short-term success at the expense of the established values and reputation;

– *secondly*, non-competitive respondents generally have a stereotypical view on the phenomenon of competition and are more critical to the individuals involved in competitive interactions, enduing them with negative qualities and attributing them to socially disapproving behavior, less likely to notice their positive qualities. In particular, non-competitive respondents are more likely to describe competition as "immoral", "inefficient" and "dishonest";

– *third*, the young people's competitiveness correlates with the manifestation of their active life position and unwillingness to shift responsibility for a possible failure to others, demonstrating an internal locus of control;

– *fourth*, among the age cohorts of the younger generation, it is the working youth who are at the initial stages of their career path, and who show their own competitive strategies to the maximum extent (especially those with higher and postgraduate education). Among the high school students, the priority of competitiveness is recognized by excellent students. Accordingly, the higher the individual's focus on success in competitive relationships, the more importance is assigned to competitiveness as a personal characteristic;

– *fifth*, young people involved in competitive interactions are more likely to show trust in people and are ready to establish and maintain social ties with others. However, competitive respondents are relatively less likely to invest resources in strong social connections (such as friendships) and do not often expect them to last a lifetime. This may indicate their

confidence in their own social "strength" and that, if necessary, there will be people from the immediate environment who are ready to help (M. Granovetter's strength of weak connections).

The obtained data indicate the desire of the most competitive youth representatives to adhere to social norms. Feeling their own priority in a particular social and labor sphere, they are aware of social and moral responsibility for the actions taken and their consequences. However, it is necessary to note the individual's need for self-restraint, when the desire to win in competitive interactions can move to the category of the unethical *("sticking at nothing")*.

The practical significance of the obtained theoretical and empirical data is determined by the possibility of using them by administrative structures in education. Educational organizations are encouraged to form ideas about ethical, correct competition, to correct semantic distortions and stereotypes about winning "at any cost" that are imposed by popular culture. The implementation of the task set is impossible without combining the social institution of the family and the mass media. Beyond that, the results of the research may be useful for educational institutions when conducting extracurricular educational work (in accordance with the young people's age).

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Birth Rate, Number of Children and Family Income: Trends and Relationships*

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Abstract. The relevance of the study of the relationship between the trends of birth rate, the number of children and family income is increasing in the context of the unfavorable demographic dynamics in most regions of the country. In this regard, the search for ways to influence the achievement of a desirable model of childbearing simultaneously meeting the interests of society and families remains a priority task. The purpose of the article is to assess the impact of the level of the number of children on the conditions of family life support in the Northern sparsely populated region, where the signs of the traditional type of birth rate are preserved. In accordance with the goal and based on the materials of the Republic of Sakha (Yakutia), the authors systematized and considered the current trends in the processes of birth rate and childbearing of families, traced the influence of the birth order factor on the level and differentiation of income and consumer behavior of families. The methodological basis of the research are the methods of demographic analysis, comparison, generalization, as well as methodological tools based on the normative method and the absolute monetary approach to income assessment, socio-demographic survey. The scientific novelty of the work consists in choosing the research object which is a region with centers of multi-child parenting, assessing the differentiation of family life support conditions depending on the number of children, substantiating the factor of material security as a significant tool for state regulation of fertility processes. The results of the research can be applied in the activities of federal and regional authorities when developing the programs for demographic and family policy, adjusting measures for the implementation of the national project "Demography". In addition, the results obtained present a large empirical material which is necessary for further study of the issues related to the competition of individual or family life needs, the value of children, on the one hand, and investment in the human capital of children or in the family life support conditions, on the other.

Key words: family, children, birth order, multi-child parenting, material security, income, rating, Republic of Sakha (Yakutia).

Introduction

One of the key tasks of modern Russian society is to achieve sustainable natural population growth. Solution of this task directly affects "Russia's fate and its historical perspective"[1]. Focusing on the historical perspective and strengthening the country's demographic potential makes it necessary to fully take into account the peculiarities of population reproduction and generation renewal in order to anticipate possible demographic "waves" and "pitfalls" and develop proactive measures to smooth them out. The condition for leveling the consequences of demographic waves and pitfalls was and still is a high birth rate, including families having many children as its result. In modern conditions, multi-child parenting is observed only in certain regions of the country, where the traditional model of reproductive behavior of families is preserved. Families' sensitivity to demographic policy measures also contributes to the increase in the number of children born, including their high sequence. In this regard, there is an increasing need for a scientific search for ways to influence the achievement of a model of childbearing that meets the interests of the state and families at the same time. It is known that the regulators of family

[1] *Presidential Address to the Federal Assembly*. Available at: http://kremlin.ru/events/president/news/59863 (accessed 08.04.2019); *Presidential Address to the Federal Assembly*. Available at: http://kremlin.ru/events/president/news/62582 (accessed 18.01.2020).

reproductive behavior are variable over time, differ in the strength, nature and duration of exposure, and are selective in the coverage of objects and territories. Material well-being and especially the level of family income are comprehensive, constantly "acting" and quite easily managed by the state factors contributing to high birth rate.

Recognition of family as a "powerful moral framework" and the value of a large family at the state level is accompanied by the development and implementation of national projects[2] and additional measures to support families with children, including in the regions[3]. At the same time, achieving the target indicators for the total birth rate in most regions of the country is problematic, which is due to the transformation of the system of population's life values, the aging of the age model and the increaseing age of those who become parents for the first time [1]. The emphasis on qualitative characteristics as opposed to the quantity ones, which is the basis of the "human capital" theory also leads to a decrease in demand and a declining number of children born and raised [2; 3]. The family is considered as an economic organization that seeks to improve the spouses' well-being [4; 5]. It should have a sufficient material basis that creates an opportunity for normal provision of children in families, the formation of human capital initial accumulation and improving the spouses' well-being [6; 7]. Numerous studies of economic motives and structural factors contributing to the birth rate indicate that the decrease in the intensity of birth rate is associated with a high need of families with children to improve their living conditions. Recognition of their conditions as unsatisfactory becomes a factor of restriction or postponement, and often even rejection of subsequent births [8-11]. According to both domestic and foreign scientists, the revision of family plans for childbearing is closely related to the number of children, family wages and income, economic difficulties and problems in the labor market [12-15]. So, the researchers agree that the full implementation of even the existing reproductive plans on a national scale should not be expected without changing the real material, social, and especially housing conditions [16; 17].

According to the typology of the country's regions the Republic of Sakha (Yakutia) is classified as a territory with the signs of social disadvantage in terms of the level and quality of population's life. The share of the population with monetary incomes below the subsistence minimum in the Republic is almost twice the national average [18]. In this regard, the question arises, what is the nature of the relationship of the signs of social, and especially financial ill-being and level of the number of children, whether there is the rationalization of childbirth in the region where, as we have previously identified [19], the value of children in the public opinion transformed the concept of "family" and has a pronounced children-focused orientation. We believe that drastic changes in reproductive needs coincide with the periods of uncertainty, and lead to childlessness in conditions of fierce competition with non-family values.

The purpose of this paper is to assess the impact of the level of the number of children on family's provision with essential services in the Northern sparsely populated region, where the signs of the traditional type of birth rate

[2] *Demographics: national project*. Available at: https://rosmintrud.ru/ministry/programms/demography (accessed 20.05.2019).

[3] Decree of the President of the Russian Federation no. 204 *"On national goals and strategic development tasks of the Russian Federation for the period up to 2024"*, dated 07.05.2018; Decree of the Head of the Republic of Sakha (Yakutia) no. 367 *"On additional measures aimed at supporting birth rate in the Republic of Sakha (Yakutia)"*, dated 14.02.2019.

are preserved. To achieve this goal, modern trends of birth rate as the main component of natural population growth in the Republic of Sakha (Yakutia) are systematized and considered; positive changes and negative manifestations associated with the sequence of children born and the number of children in families are identified; it is traced how the factor of the number of children affects the level and differentiation of family incomes, consumer behavior; an assessment of the differentiation of families with different number of children by income indicators is made.

Despite the many-sided research on the problems of poverty of families with children, the obtained results are intended to show the degree of differentiation of families with children by the level of their material security in the region with centers of multi-child parenting and help in finding an effective tool for state birth control.

Materials and methods

The information base of the research was made up by the statistical data of the Federal State Statistics Service of Russia, the Territorial body of Rosstat in the Republic of Sakha (Yakutia), the materials of all-Union (1979, 1989) and all-Russia (2002 and 2010) population census and micro-census of 1994 and 2015.

The authors used the methods of component analysis of the total coefficient on birth order, calculation of mother's average age at the birth of children, comparative analysis when assessing the potential fertility and the rate of change of urban and rural families by the number of children.

To construct the distribution of the respondents' families by income level, rating of families by income and individual indicators of material well-being, we used the materials of a sociological survey conducted in the form of a multi-stage quota stratified sample in seventeen municipal districts of the Republic of Sakha (Yakutia) (n = 1670, sampling error – 2.8%)[4].

The method of the respondents' families distribution by income level is based on a normative criterion. It is based on the classification of population groups by income, developed by the experts of the all-Russian center for living standards – having the least level of income (poor), having low income, having lower-middle income, having middle income, having high income [20]. The criterion of assignment to a particular group are social standards – a living wage, socially acceptable (recovery) consumer budget, average income consumer budget and high income consumer budget, the magnitude of which is approximately related as 1:3:7:11. In contrast to this classification, we have identified three groups of families by their income level (poor, low-income and middle-income), which is associated with a small share of middle-income and almost absence of high-income families in the analyzed population. In addition, the study focuses on income differentiation as the number of children in the respondents' families increases. When defining the poor, we follow an absolute monetary approach (households are recognized as the poor when their average per capita monetary income is below the minimum subsistence level). The threshold value separating the low-income and middle-income groups is 2.5 subsistence minimums, since the socially acceptable (recovery) consumer budget is at least 2.5–3 subsistence minimums [21, p. 973]. The middle-income social group brought together lower-middle-income and middle-income families.

[4] A sociological survey on the study of demographic, social, structural features and trends in the reproduction of human potential of the Republic of Sakha (Yakutia) was conducted in September – October 2017 on the territory of the Republic with the personal participation of the authors.

The rating on income indicators and their differentiation, as well as on individual characteristics of well-being is based on a comparison of these indicators in families by the number of children, where 1 is the best and 4 is the worst position.

Main results

Against the background of a long and significant drop in the birth rate in most Russian regions, Yakutia is seen as a territory where a relatively high birth rate remains. The total birth rate in 2018 was 1.85, compared to the average in Russia of 1.58. At the same time, there is a noticeable differentiation of birth rate in the Republic depending on the type of the territory: for example, if the considered indicator in urban areas in 2018 was 1.58 (RF – 1.49), in rural areas its value reached 2.47 (RF – 1.87). In the birth rate dynamics, a sharp jump occurred in 2007, as a response to additional measures of material assistance to families, encouraging repeated children births (maternity capital, increased benefits, covering children's stay in preschools, etc.). According to our assessment, in 2007, the increase in the birth rate was determined by an increase in its age coefficients by 88%, the increase in the intensity of births was especially marked in rural areas of the republic (92% of the increase in births) [22]. Baby boom was also observed in 2012 in response to the measures of the regional demographic policy: the republican maternity capital "Family", the allocation of land plots to families with many children. The maximum value was reached in 2014.

The effectiveness of demographic policy measures has affected the increase in the average order of children births. At the same time, in urban areas, there is a clear decrease in the total coefficient for first births, which indicates the postponing of the first child's birth. This is also caused by later marriages. The average age of the mother at birth increases; the trend is especially significant in urban areas. The average age of birth debut increased, having reached 25.4 years among urban women and 23.2 years among the rural ones in 2018 (*Table 1*).

The contribution of first births to the total rate decreased from 42.8% in 2007 to 33.6% in 2018. The share of second births in the structure

Table 1. Total birth rate by the order of births and average age of the mother at birth of children, Republic of Sakha (Yakutia)

Year	Total birth rate, number of children	Including births, number of children			Average age of the mother at birth, years	
		firs	second	third and following	All births	First birth
Total population						
2007	1.911	0.817	0.650	0.444	26.1	22.8
2014	2.255	0.811	0.770	0.674	28.0	24.2
2018	1.849	0.622	0.613	0.614	28.6	24.6
Urban population						
2007	1.725	0.820	0.627	0.278	26.2	23.1
2014	1.801	0.663	0.664	0.474	28.5	24.9
2018	1.581	0.554	0.566	0.461	29.2	25.4
Rural population						
2007	2.305	0.805	0.684	0.816	26.0	22.3
2014	3.379	1.186	1.036	1.157	27.2	22.8
2018	2.474	0.752	0.715	1.007	27.6	23.2
Calculated by: Primary data of the statistical registration of births of Sakha (Yakutia)stat.						

of the total birth rate remains relatively stable, about 34%, being ahead of the contribution of first-born births. Third and subsequent births received a noticeable increase in 2014, their share in the total birth rate reached 30%. According to the results of 2018, every third newborn in Yakutia appeared in a large family. Compared to 2007, the component of the total coefficient determined by third and subsequent births increased by 38.3% by 2018, while the first-born births registered a 23.9% decrease. The decline in the birth rate observed in recent years has mostly related to the first-born children. The decrease in the contribution of this group of newborns outpaced the decrease in the total coefficient for the births of all other orders.

In urban areas of the Republic a trend to reduce the contribution of first births is clearly visible, in rural areas there is an increase in births of all orders; as a result a significant potential of increasing fertility and preservation of large families traditions is revealed here: over 40% of rural infants in 2018 were born in families with many children.

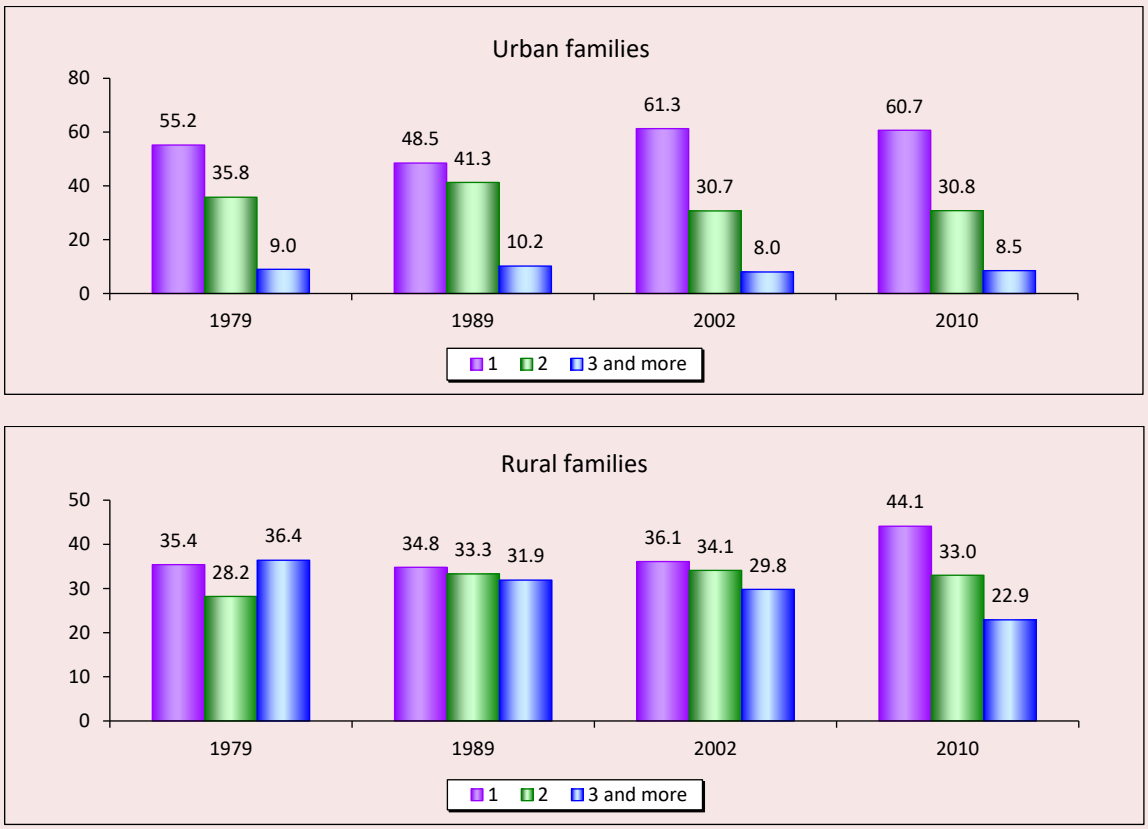
The emerging trend in the birth rate is the result of the regulation of childbearing in families, which can be seen in the analysis of women's reproductive behavior by the year of their marriage. According to the 1994 micro-census, 4,545 newborn children were accounted for by 1,000 women who married for the first time in 1950–1954, including 3,026 in urban and 5,082 in rural settlements. According to the 2015 population micro-census, this figure was 1,865, 1,642 and 2,199 children, respectively, for the generation of women who married in 1990–1994.

However, over time, the differentiation in the number of children born by urban and rural mothers started showing signs of smoothing. This trend is formed by a noticeable change in the rural mothers' behavior. For example, rural women who married in the first half of the 1950s were 5.3 times less often than urban women likely to have only one child, and among women who married in the 1990s, the difference was only 1.5 times. A similar ratio is observed for women who gave birth to both two (4.9 and 1.4 times) and three (3.2 and 0.7 times) children.

The birth rate observed in Yakutia in the 1970s and 80s provided a fairly high rate of growth in the number of families with children and, accordingly, their high share in the total number of families (about 75%). The decrease in the birth rate naturally led to a decrease in the share of families with children: 58.9% on average in the Republic in 2010, 54.6% in urban and 67.7% in rural settlements. In urban settlements in the 1970s, despite the predominance of women who gave birth to two children, every second child was the only one in the family. According to the 2002 and 2010 censuses, the percentage of families with one child here exceeded 60%. And in rural families, the visible gap between single-child families and families with more children is observed only during the last census.

It was noted above that the distribution of urban women by the number of children they have is very smooth, and the composition of urban families by the number of children is sharply differentiated. Thus, the proportion of families with one child in 1979 was 1.5 times higher than the relative number of families with two children, and more than six times higher than the proportion of families with three or more children. In 2010, this preponderance increased even more (2 and 7.1 times, respectively). In turn, the number of families with two children in 1979 exceeded the share of multi-child families 4 times, in 2010 – 3.6 times.

Figure 1. Dynamics of urban and rural families share by the number of children under 18 for the period of 1979-2010, %



Calculated by: *Results of the all-Russian population census of 2002: Stat. Coll.: Vol. 13. Number and composition of families of the Republic of Sakha (Yakutia) / Sakha(Yakutia)stat.* Yakutsk, 2007, pp. 13–15; *Results of the all-Russian population census 2010: stat. coll. Vol. 6. Number and composition of households in the Republic of Sakha (Yakutia) / Sakha(Yakutia) stat.* Yakutsk, 2013, pp. 220–222.

The data shown in *figure 1* illustrate not only quantitative changes in the number of children directly in urban or rural families, but also significant differences in the patterns of childbearing in them. It is clear that the structure of urban families in terms of the number of children is markedly differentiated, in contrast to rural families. Although the decline in the number of children in families is in line with the global trend in the birth rate, the republic, especially its rural areas, demonstrate a high proportion of families with many children.

Despite the identified changes in reproductive behavior (including the postponement of first-born births, an increase in the average age of birth debut), the Republic of Sakha (Yakutia) still has the potential to increase its birth rate. This is evidenced by the results of micro-censuses of the population in 1994 and 2015. The average number of expected children in 1994 was 2,623 per 1,000 women aged between 18 and 44[5].

Despite the decrease in this indicator (according to the results of the 2015 micro-census, it reached 2,100 children), its value is significantly higher than the average Russian value of the average number of expected births

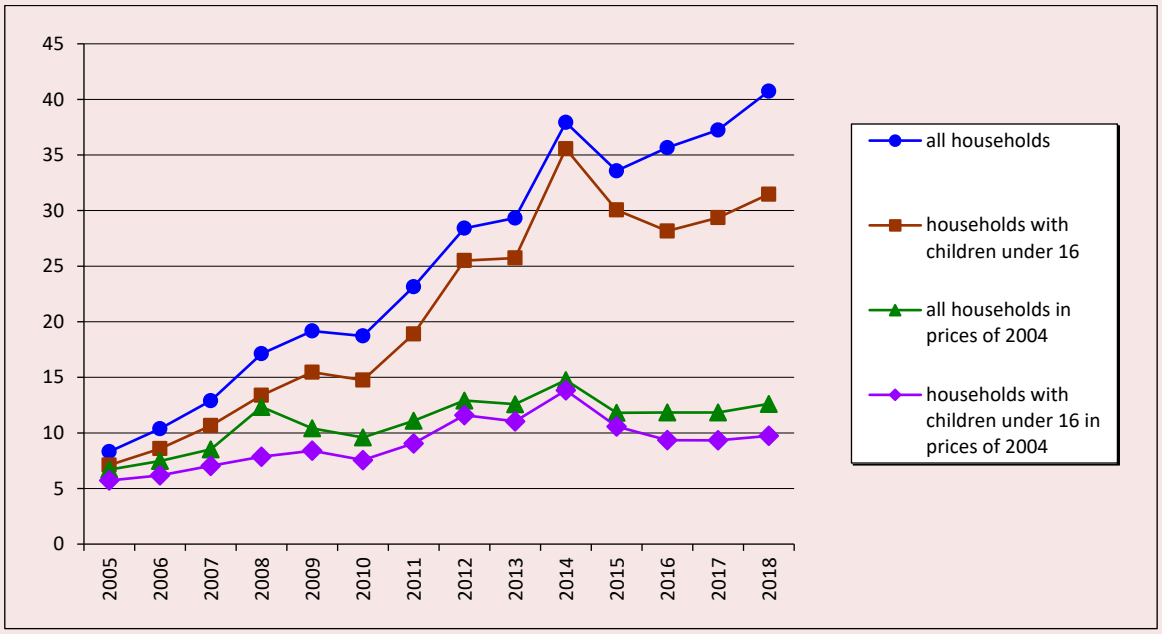
[5] *Marriage status and birth rate in the Republic of Sakha (Yakutia). Results of micro-census of the population in 1994. Vol. 3.* Yakutsk: Goskomstat RS(Ya), 1995, p. 45.

(1,730), as well as the values of almost all regions of Russia, with the exception of the North Caucasus Federal district (2,250)[6].

At the same time, the birth of each subsequent child affects the decline in the material well-being of families and their income [23], as evidenced by both the data from sample surveys of household budgets and the materials from sociological research. According to the results of a sample survey of the population's income and participation in social programs in 2016, 61.3% of Yakutia's households living in rural areas fell into the category of poor, which is 1.6 times higher than for urban households (38.7%)[7]. Families consisting of three or more people are at significant risk of falling into the category of poor (88.4%). For small families (1-2 people), this risk does not exceed 12%. The same ratio applies to households with minor children and those without children. A just noticeable risk reduction is recorded for families with children under 16 (84.5%)[8].

Family's balancing on the poverty line is determined by the amount of available resources, while their size in families with children has always lagged behind the average values (*Fig. 2*). The peak of the increase in figures in comparable prices was in 2014 making up 2.4 times higher than in 2005. After that, its decrease is observed again.

Figure 2. Dynamics of disposable resources in the households of the Republic of Sakha (Yakutia) for the period of 2005–2018, thousand rubles



Calculated by: *Consumer price indices (tariffs) for goods and services.* Available at: https://sakha.gks.ru/folder/32336 (accessed 21.10.2019); *Composition of available resources of households of various socio-economic categories.* Available at: https://sakha.gks.ru/folder/32339 (accessed 21.10.2019).

[6] Calculated by: *Birth rate and reproductive plans. Results of the population micro-census in 2015.* Available at: https://gks.ru/free_doc/new_site/population/demo/micro-perepis/finish/micro-perepis.html (accessed 25.10.2019).

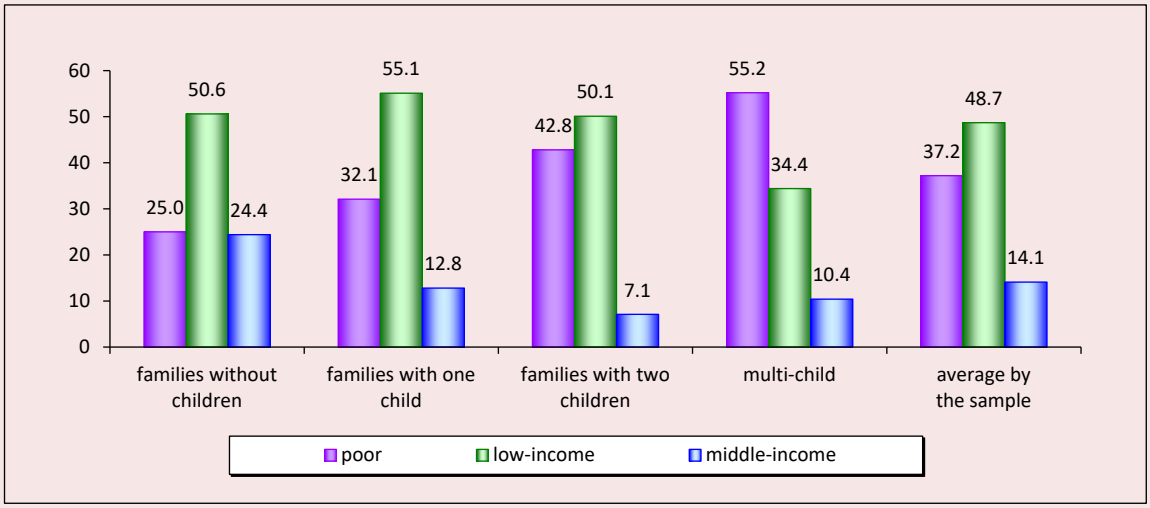
[7] *Distribution of poor households by major socio-demographic groups.* Available at: http://www.gks.ru/bgd/regl/b18_110/Main.htm/ (accessed 11.04.2019).

[8] *Statistical Yearbook of the Republic of Sakha (Yakutia),* 2018. Yakutsk, 2019, p. 153.

In this regard, it is important to determine the role of children in the subjective assessment of the level of material well-being of a family based on the results of a sociological study conducted in Yakutia in 2017. According to the data provided, there is no "high-income" category in the distribution of families with children at all. In addition, it can be seen that each subsequent birth leads the family towards a low yield. Thus, the share of average-income families with many children is 2.4 times lower than the share of those with no children. Conversely, the proportion of poor families with three or more children is twice that of those without children (*Fig. 3*).

An increased risk of reducing the material well-being of families with arrival of children is accompanied by a deterioration in consumption (*Table 2*). 30.4% of families without children and 41–67.8% of families with children have

Figure 3. The distribution of the respondents' families by level of income depending on the number of children, %



Calculated by: The materials of the sociological survey, 2017.

Table 2. Differentiation of consumption of respondents' families depending on the presence of children, %

Consumer characteristics	Number of children in families				
	0	1	2	3	4 and more
Money is not enough even for food	3.0	5.4	4.3	7.0	9.7
Everything is spent on everyday expenses	13.7	22.5	21.5	23.5	38.7
Money is enough for everyday expenses, but buying clothes is difficult	13.7	13.1	18.4	19.1	19.4
Money is generally enough, but we need to take out a loan to buy expensive items	31.8	36.7	34.0	33.0	12.9
Money is enough everything almost for everything, we can buy large purchases on credit (apartments, cars, cottages, and so on)	21.7	10.4	16.0	11.3	9.7
We do not deny ourselves almost anything, we can buy everything without credits	13.1	6.3	4.0	3.5	3.2
No answer	3.0	5.4	1.8	2.6	6.5
Total	100.0	100.0	100.0	100.0	100.0
Calculated by: The materials of the sociological survey, 2017.					

difficulties in purchasing food, daily expenses and clothing. A third of families have enough money generally, but expensive items are purchased on credit. Families provided with everything they need and which can afford large purchases on credit (or without it) make up 34.8 and 13-20%, respectively. We assume that families without children can make large purchases by saving money for them, while families with children are forced to take out a loan for these purposes.

The frequency of mentioning individual expenditure items varies slightly in families with and without children, but there are certain changes in the formation of family expendi-tures due to the appearance and increase in the number of children (*Table 3*). Detailing consumer characteristics by expenditure items shows that, regardless of the family composition, the largest share of expenditures falls on food (just below 40%). A significant item of expenditure is loans (about a quarter of all households' expenses), which increase the security of durable goods and real estate. However, low family income reduces the ability to use money for other expenses and savings, thereby limiting families' consumption. In addition, with

Table 3. Distribution of expenditure items in the family budget depending on the composition of the respondents' families, % by frequency of response selection

Expenditure item	Families		
	Without children	With one child	With two and more children
food	36.3	38.9	38.4
utilities, Internet, communications	16.2	17.1	16.4
transportation expenses	10.0	9.5	9.5
credit	22.3	23.0	26.3
buying clothes	12.9	11.4	12.4
eating out	8.2	5.6	5.7
university education, courses	14.8	11.4	14.2
sports sections, fitness	5.8	5.7	7.5
travelling	16.6	15.4	13.4
Calculated by: The materials of the sociological survey, 2017.			

Table 4. Ranking of families in terms of income and material well-being

Rating indicator	Number of children			
	no	1	2	3 and more
Provision of durable goods	3	4	1	2
Owning real property	4	3	2	1
Income from renting or leasing property	1	2	4	3
Savings	1	4	3	2
Per capita monetary income, rubles per month	1	2	3	4
Modal income, rubles per month	1	2	3	4
Median income, rubles per month	1	2	4	3
Decile coefficient of differentiation, times	4	1	2	3
Gini index	1	3	2	4
Poor	1	2	3	4
Low-income	3	4	2	1
Average-income	1	2	4	3
Calculated by: The materials of the sociological survey, 2017. Note: 1 – best position, 4 – worst position.				

an increase in the number of children in families, the share of credit expenses increases to 26.3%.

A significant item of families' expenditure, regardless of its composition, is utility bills, payment for the Internet. Family composition also does not significantly affect the differences in clothing and transportation costs. While, the expenditure items for travelling, education, sports, and eating out are largely determined by the number of children in families.

Comparison of the main indicators of families' material well-being depending on the number of children in them allows to build a rating (*Table 4*).

It can be seen that having many children is accompanied by the worst position of the family in the rating scale for average per capita income, modal income, and the Gini index, and is characterized by a high risk of family transition to the category of poor. Limiting a family to two children affects the family's position in the rating to varying degrees. In general, two-child families are more likely to be middle-income. The birth of the first child leads to a shift in the family's position towards a downgrade. The successful implementation of the national project "Demography" and other Federal and regional projects will help to reduce the degree of differentiation of families with children by the level of material security.

Conclusion

Thus, the global trend of declining birth rates has affected the Republic of Sakha (Yakutia) too. A component analysis of the total fertility rate revealed a high contribution of third and subsequent births, which affected the rate of change in the share of multi-children families, especially in rural settlements. According to the results of the population micro-census in 2015, the potential of birth rate growth in the republic is higher than the average in Russia. It shows the positive demographic intentions of the population.

The socio-demographic survey confirmed that the objective obstacle to the reproductive intentions' implementation is the level of family income. Thus, every second large family belongs to the poor, with incomes below the subsistence minimum per a family member. As the number of children decreases, the share of the second group of families, the low-income ones, increases. The increase in the number of children is accompanied by an increase in the gap in the families' consumer opportunities, the share of spending on everyday needs. Having many children leads to the worst position of a family in the rating scale for average per capita income, modal income, and the Gini index.

Increasing families' income by taking measures to reduce the level of poverty and prevent its "reproduction" through income and employment policies will expand the opportunities for implementing reproductive plans. In this context, the impact on the material security of families is perceived as an important tool for state regulation of the birth rate in parameters that meet the interests of the state and the family.

Systematization of stable trends of fertility, number of children and family income will serve as a methodological basis for the preparation of demographic development scenarios aimed at anticipating the adverse impact of subsequent demographic "waves". The results and empirical material presented in the paper are of scientific and practical interest in the study of problems related to the life needs of an individual or family, the value of children, on the one hand, investments in the human capital of children or in the conditions of family life support, on the other.

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Small Business and Living Standards of the Population: Mutual Influence and Management Issues*

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Abstract. Small entrepreneurship is an important element of the socio-economic system of the region, because it contributes to the creation of competitive environment, the consumer's market saturation and stimulation of aggregate demand, as well as to structural changes, etc. As a systemically important element of the municipal units' economy, it has an impact on developing the infrastructure and filling the budget of local territories. It contributes to solving one of the main tasks of the social state – to increase the population's living standards in the country. The high significance of small business determines the demand and necessity of its development. However, at present the aspects of its interconnection with the population's living standards remain insufficiently elaborated, which makes it difficult to implement effective public policy on managing these categories. The researchers have presented two main approaches to defining this interaction. In the first variant, the functioning of small business contributes to improving

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the population's living standards. In the second variant, the availability of capital and consumer demand, provided with people's high revenues, are the main factors of small business development. Under the conditions of limited resources, the ambiguity of such dependence confirms the relevance and necessity of elaborating scientifically based directions of state influence and the system of measures for stimulating the development of these categories. Therefore, the aim of the study is to assess dependence of small business and the population's living standards, as well as to establish mainstreaming scientifically based directions of public management and the system of measures, contributing to the development of the small business sector and the improvement of the population's living standards as a whole. In order to achieve the goal, the empirical assessment of interconnection between the development of small business and the population's living standards has been carried out, which allows to determine the specific characteristics of their mutual influence. The recommendations on improving the existing system of public management regarding the development processes of small business and improving the population's living standards in the Russian Federation's entities have been scientifically justified. The empirical basis of the study includes the data from the Federal State Statistics Service and the results of monitorings, conducted by Vologda Research Center of the Russian Academy of Sciences. The materials of the article can be used by the federal and regional government bodies and administrative authorities for adjusting public policy in the field of developing the regional economy.

Key words: public management, small entrepreneurship / small business, business, living standards, the population's differentiation according to revenues, mutual influence.

Introduction

For Russia, entering upon the path of modernizing the economy, the development of small business (SB) takes on particular significance. Only this process is capable of quick and effective solving the problems of restructuring the economy, the consumer goods market's formation and saturation under the conditions of limited resources without requiring large start-up investments [1]. The SB entities are operating in all sectors of the national economy. They implement the human need for creation, and consequently, consolidate in their structures increasingly broader layers of population.

Small business plays an important role in providing employment for the working-age population due to its specific characteristics. Firstly, it can quickly create new jobs of low capital intensity, increasing the population's actual revenues and living standards (the PLS). Secondly, the lower technical composition of capital is characteristic for small enterprises. This means that they have more units of labor per unit of the used means of production than the large enterprises. Thirdly, small business is attractive for the active population's performance, because it gives significant opportunities for displaying initiative and implementing creative ideas [2].

Complicating the functional relations of small business entities includes the increasing impact of external and internal influencing factors on implementing the entire process of business activities [3–7]. According to some Russian researchers [8; 9], the population's living standards are one of the important influencing factors of the external environment. The low level of people's revenues and the insufficient credit availability, justified by the lack of the necessary volume of collateral capital, hinder the development of small business. The works of foreign economists,

in particular D. Keeble [10], show that in the 1980s the growth of entrepreneurial activity in developed countries was mainly caused by the increase in revenues of citizens, and effective demand for more differentiated goods and services.

Hence, there is a certain interdependence between the functioning of the SB and the PLS, which should be defined, and the effects on the economy have to be assessed in order to solve the research problem of providing the implementation of public management processes in developing these categories in a resource-constrained environment. In this regard, the aim of the study is to assess the dependence between the functioning of the SB and the PLS, as well as to establish mainstreaming scientifically based directions of public management and the system of measures, contributing to the development of small business sector and the improvement of the population's living standards as a whole.

In order to achieve the goal, it is necessary to solve the following tasks:

– to study the existing theoretical and methodological approaches to describing the interconnection between small business activities and the population's living standards;

– based on the empirical analysis of the indicators regarding small business activity and the population's living standards to identify the peculiarities of mutual influence for these categories;

– to justify the mainstreaming directions of the state impact on small business development in the context of improving the population's living standards.

The theoretical and methodological basis of the research comprised of the studies conducted by national and foreign scientists in the field of analyzing and measuring living standards (V.N. Bobkov, L.N. Ovcharova, A.Yu. Shevyakov, D. Acemoğlu, M.F. Förster, M. Orshansky, etc. [11-16]), including the absolute, relative and subjective approaches to the poverty assessment; trends of small business development (V.G. Basareva, K.A. Gulin, T.A. Dubrova, A.V. Kolchugina, etc. [1; 8; 9]). The study's information base is composed of the data from the Federal State Statistics Service and the sociological survey "Monitoring of the population's economic status and social well-being in the Vologda Oblast", carried out on the territory of the Vologda Oblast[1].

Theoretical aspects of the research problem

Problems regarding the interconnection and management of the population's living standards and small business development have been considered by both foreign and national scientists and researchers. The idea that the dynamics of small business development within a particular territory depend on the well-being of its population has been expressed by J. Schumpeter in the 1930s [17]. The scientist has noted that the development of the entrepreneurial sector is connected not only with the population's risk liability, but also with the availability of capital, which is necessary for opening its own business. Thus, the following hypothesis has been formed: the more savings the society has, the more is the number of small enterprises.

G. Loveman and W. Sengenberger have drawn this conclusion after analyzing trends in key indexes of the population's employment in small business sector and the property status of working population, using the six OECD member-states as an example [18]. Scientists have noted that the increase in the number of people employed in the economy sector under consideration is connected with two factors:

[1] The sample size comprises of 1500 people, 1 time in 2 months (consequently, the sample size per year is 9 thousand people). The sampling method involves zoning with proportional allocation of survey units. The sample type is the quota sample by gender and age. The sample error does not exceed 3%.

– the decentralization and fragmentation of large enterprises according to separate production directions;

– the increase in purchasing demand for more differentiated goods resulting from the growth in the population's living standards within a particular territory.

The researchers have also proved that in developed countries the growth in the number of small enterprises is related to the increase in the population's revenues, which therefore has provided the opportunity to satisfy the needs of people and to segment the existing market.

In his works D. Keeble considers the factors contributing to the creation of new enterprises in England and presents three theoretical models [10]. In the first work the author shows the model of economic recession, reflecting the dependence of the number of potential entrepreneurs on the growth of unemployment. The second work describes the model of the growth in population's revenues, which demonstrates the impact of demand on the development of this economy sector. The third model emphasizes digitization and implementation of new technologies contributing to the formation and development of new firms and enterprises that can quickly adapt to changing external and internal conditions within their own activities.

However, there is a reverse approach to reviewing this dependence. After analyzing the impact of small business sector on the growth of the US well-being, P.D. Reynolds has proved that the economic shift in the period of 1976-1984 that led to the economic growth and the improvement of the population's living standards has been achieved by the intensification of activities in small firms [19].

D. Berkowitz and D. N. DeJong have revealed the dependence of the population's revenues and the local territory's economic growth on the development level of small business entities using the statistical analysis of the data from 47 central cities in the Russian Federation's entities [20].

The representatives of the national science also do not share a common view on this issue. For example, the employees from the Institute of Economics of the Russian Academy of Sciences note that first of all, it is necessary to include the low level of the population's living standards and the insufficient availability of borrowed funds for the opening of a new business and providing its activity among the objective factors preventing small business sector's development [9].

The representatives from the Institute of Economics and Industrial Engineering within the Siberian Branch of the Russian Academy of Sciences hold the opinion that the economy's state, the population's health and its educational potential are the main factors in the formation of conditions for the appearance and development of the private initiative and small business within the local territory.

T.N. Kosheleva, Doctor of Sciences (Economics), Professor of the St. Petersburg University of Management Technologies and Economics, considers the resource potential of small business among the main factors determining its development. Economic, production, personnel, organizational and other opportunities of the sector under study have been included in it, as well as business risks, that, therefore, directly depend on the PLS [21].

T.A. Dubrova, Doctor of Sciences (Economics), Professor of the Department of Mathematical Statistics and Econometrics of the Moscow State University of Economics, Statistics and Informatics (MESI), has proved the impact of generalized factors (the degree of ICT development) and factors of the population's well-being, as well as the demographic situation in the region on the processes of functioning and developing small

business based on the building of a multiple regression model [22]. The main conclusion of the work shows that it is necessary to improve not only the economic, but also the social sphere of the economy, increasing the population's living standards in the country's regions in the process of forming the environment for small business.

However, there are scientific papers considering small business as a factor increasing the population's living standards. Thus, V.I. Petrishche, Candidate of Sciences (Economics), the employee of the Russian Presidential Academy of National Economy and Public Administration, in his works based on analyzing regional statistics of the Russian Federation has concluded that small business is the source of increasing employment and reducing unemployment [23]. Studying the existing practice of developing the economic sector under consideration, S.V. Terebova, Doctor of Sciences (Economics), proves that SB is the most important source of increasing employment and revenues of the population in the region [24].

Thus, the analysis of works devoted to this problem has shown the interconnection between the development of small business and the population's living standards, but the ambiguity in approaches to their dependence confirms the relevance of determining the primary nature of mutual influence. The answer to this question will allow to identify the favorable direction for spending public funds in the sphere of the categories under study in order to provide effective development and growth of the country's economy. In order to solve this problem, it is reasonable to carry out an empirical analysis of the interconnection between SB and the PLS. It will be presented in the next step of the research.

Analyzing the existing features of the mutual influence between small business and the population's living standards in Russia

During the period from 2008 to 2018, the development of small business in Russia has come against the background of the difficult economic situation that affected the level of the population's actual revenues, consumer demand and availability of borrowed funds. In order to analyze the existing trends, it is reasonable to consider the changes in the main indicators characterizing the development of SB and the population's living standards in all entities of the Russian Federation as a whole.

One of the main characteristics of the small business sector in the region is the indicators of its prevalence within the territory of the study object. In particular, the list of indicators includes the number of SB subjects and the average number of their employees, calculated per 1000 people of the total population size and the number of employed in the economy respectively (*Table 1*).

Table 1. Prevalence indicators of SB entities

Type	Year						Ratio, 2018 to 2009, %
	2009	2011	2013	2015	2017	2018	
Number of SB entities per 1000 people, units / thousand people							
Small enterprises	1.6	1.6	1.6	1.7	1.7	1.6	101.1
Micro-enterprises	9.7	11.1	12.7	15.2	17.4	17.0	175.6
IB	–	–	17.4	16.8	17.3	17.5	100.6*
Average number of SB employees per 1000 employed people, units / thousand people							
Small enterprises	91.9	92.8	102.0	92.0	92.7	87.3	95.0
Micro-enterprises	74.3	64.4	70.2	72.9	76.2	74.0	99.5
IB	–	–	80.0	78.2	79.9	80.9	101.1*

*Ratio, 2018 to 2013 , %
Compiled by: data from the websites www.gks.ru; www.fedstat.ru.

The planned development of the economic sector under study has been observed within the territory of the Russian Federation during the period of 2009–2017. The exception is 2018, because there has been a decrease in both population size and the number of employed in most categories of SB. However, the overall dynamics in the number of SB entities is negative over the entire period (*Fig. 1*). In 2015–2016 the sharp increase in the number of SB entities has been noted within the territory of the Russian Federation, the main reason of which were the changes in the Federal Law dated July 24, 2007, No. 209-FZ "On Development of Small and Medium Business in the Russian Federation", accepted December 29, 2015. As a result, the threshold values in the gross income of business entities, acting as a criterion for ranking among small business, have increased twofold. That has led to an artificial increase in the number of entities of the economic sector under study in 2015, but the trend towards the decline in the growth rate of the indicator remained unchanged.

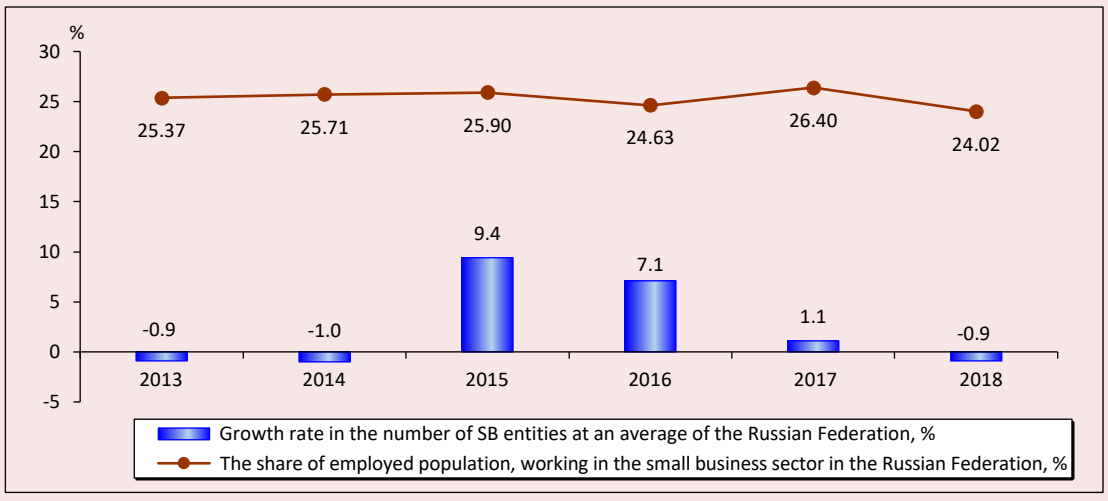
Nearly unchanged share of the employed population working in small organizations has evidenced regarding the absence of significant changes in the prevalence of SB during 2014–2015 within the territory of the Russian Federation's entities, but the population size employed in SB decreased by 1.72% in the period of 2012–2018.

The decrease in development indicators has revealed the fact of reducing SB performance activity (*Table 2*). On average of the Russian Federation during 2009–2018 the average turnover of the one SB entity increased by 5.5%, meanwhile, the same indicator in the category of micro-enterprises decreased almost by 18%.

For the country as a whole the value of that indicator has decreased by 6% for all the categories of SB entities (*Fig. 2*). It is worth mentioning that since 2015 its constant growth has been observed within the territory of the Russian Federation (by 25% in 3 years).

Meanwhile, the average volume of fixed investment per one SB entity has been decreasing almost by 13%. Therewith, in physical terms the volume of investments for the period of 2016–2018 has increased by 13%, as well as the turnover indicator.

Figure 1. Dynamics in changes of SB prevalence indicators at an average of the Russian Federation, %

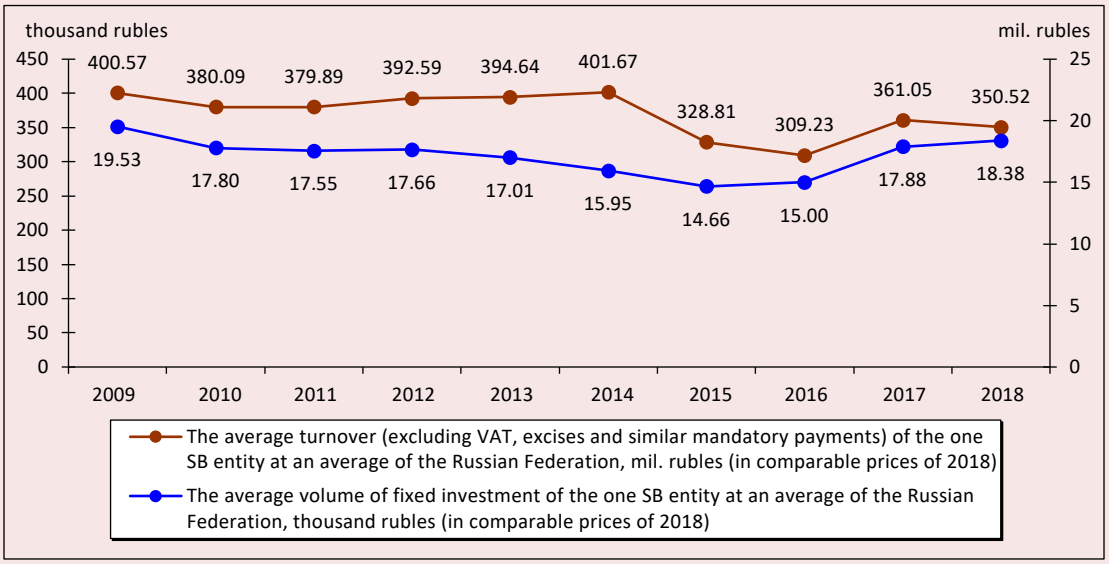


Source: data from the websites www.gks.ru; www.fedstat.ru

Table 2. SB development indicators in the Russian Federation

Type	Year						Ratio, 2018 to 2009, %
	2009	2011	2013	2015	2017	2018	
Average turnover (excluding VAT, excises and similar mandatory payments) of the one SB entity, mil. rubles (in comparable prices of 2018)							
Small enterprises	10.19	11.36	10.76	7.87	10.26	10.75	105.53
Micro-enterprises	9.34	6.19	6.25	6.79	7.62	7.63	81.71
Average volume of fixed investment of the one SB entity, mil. rubles (in comparable prices of 2018)							
Small enterprises	0.29	0.25	0.27	0.19	0.21	0.19	64.25
Micro-enterprises	0.11	0.13	0.13	0.14	0.16	0.16	145.50
Compiled by: data from the websites www.gks.ru; www.fedstat.ru.							

Figure 2. Dynamics of SB development indicators at an average of the Russian Federation (in comparable prices of 2018)



Source: data from the websites www.gks.ru; www.fedstat.ru

The specified fact shows the decrease in indicator values of SB development within the territory of the Russian Federation's entities. The problems mentioned above regarding the development of the small business sector are intimately connected with the low level of investment. For the period from 2008 to 2018 small business accounted for about 5% of all investable funds in Russia. Meanwhile, the share of investments in small business in a number of regions has reached more than 25% (the Pskov Oblast, the Republic of Ingushetia, the Penza Oblast, etc.). The minimum value has not exceeded 1% (the Chechen Republic, the Chukotka Autonomous Region, and the Tyumen Oblast). Therewith the ratio of the maximum and minimum values of the analyzed indicator across the Russian Federation's entities during the period under study has comprised more than 100 times. However, it should be taken into account that in Russia's regions with high value of extractive industry, having the export-oriented focus based on raw materials, the fixed investment, falling on small business, are often "lost" against the background of the general large-scale

investment flow. Nevertheless, in absolute terms the total number of investments in small entrepreneurship in these entities is quite large.

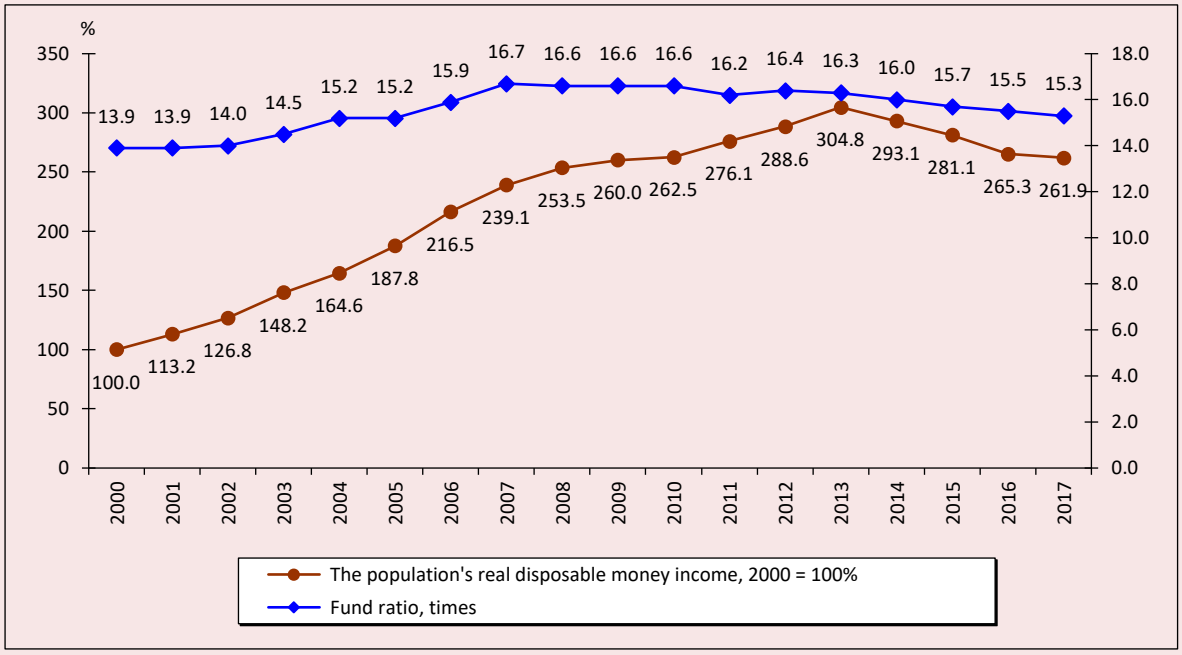
The Federal State Statistics Service regularly conducts sample inquiries regarding investment activity of industrial small enterprises. According to their results, among the main factors, limiting the investment activities in 2017 the following ones have been mentioned: lack of own funds (52%), uncertainty of the economic situation in the country (32%), high percentage of commercial credit (29%) and insufficient product demand (27%).

Low investment activity of small business representatives is quite logical due to the anxiety concerning the insufficient effective demand of the population in the regions. As noted above, during the period under study small business has faced many problems, one of which was the decline in the population's purchasing power. Overall, since 2006 the growth rates of actual revenues have gradually decreased towards 2000. Subsequently, after 2013 the decline has taken place and it is observing at the present moment (*Fig. 3*). Simultaneously, along with the growth in the population's average revenue, the increase in differentiation according to material character has been noted. Thus, for the period from 2000 to 2017 the fund ratio has increased from 14 to 15 times.

The rising population's inequality in revenues has been caused by the higher growth rates in money income among the most well-off social groups with almost constant revenue level of the least well-off ones, which does not exceed the minimum subsistence level [25].

The trends revealed above are also embodied in the subjective characteristics, which people give regarding their lives. It should be noted that subjective estimates of poverty are usually higher than its estimates according to the absolute and relative approaches. Steadily more than 40% of

Figure 3. Dynamics of the population's money income per capita and fund ratio in the Russian Federation in 2000–2017



Source: data from the websites www.gks.ru; www.fedstat.ru

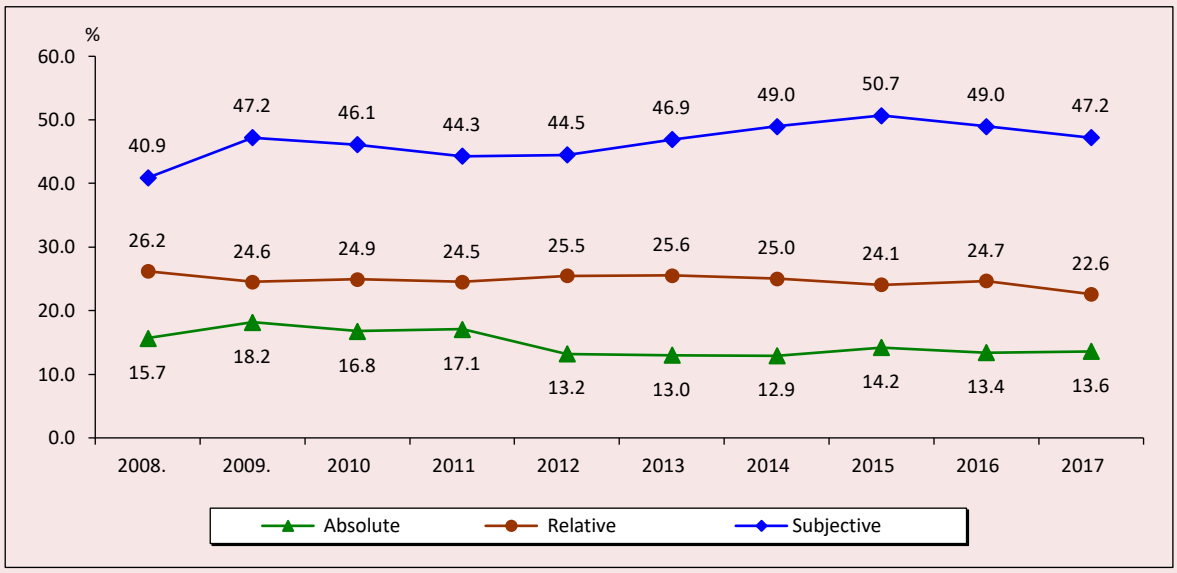
the region's population consider themselves as poor or deprived, whereby, an obvious trend of declining estimates has been observed (*Fig. 4*). In the meantime, according to the official data, only 14% of the region's population had revenues below the minimum subsistence level, while the revenues below the median revenue level in the region, according to our estimates equaled 23%. This point is fundamentally important. It is subjective assessments that have the greatest influence on the individual's psychological state and give rise to internal incentives that are largely shaping the consumer practices of citizens.

It should be noted that the real retail turnover per capita has slightly increased in 2008–2017 only by 7% in Russia as a whole (*Table 3*). Therewith since 2013 the retail turnover per capita has decreased by almost 10 p.p.

In the structure of the Russian retail the share of non-food products has shown a decrease by 2 p.p. for the period of 2008–2017, which is one of the signs characterizing the population's living standards in the regions not from the best positions.

The general trend in reducing the values of key indicators reflecting the development of small business and the population's living standards confirms the necessity for the state influence on them. Due to the fact that there exist dual mutual influence between these categories, revealed earlier, and it is necessary to take it into account in the process of choosing the directions and support measures for the economic sector under study, it seems appropriate to carry out the econometric assessment of this interaction. For this purpose, based on the existing experience in studying

Figure 4. Poverty level of the Vologda Oblast's population according to absolute, relative and subjective approaches, %



Absolute poverty level is the share of population with revenues below the minimum subsistence level;
Relative poverty level is the share of population with revenues below the median revenue level in the region;
Subjective poverty level is the share of population identifying itself as poor and deprived.

Sources: data from the website of the Territorial Body of the Federal State Statistics Service in the Vologda Oblast. Available at: http://vologdastat.gks.ru/; Monitoring of the population's economic status and social well-being in the Vologda Oblast, VolRC RAS, 2007–2018; compiled by the authors.

Table 3. Dynamics and structure of retail turnover in 2008–2017

Territory	Year										Variation, 2017 to 2008, p.p.
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
*Retail turnover per capita, thousand rubles**											
The Russian Federation	189.9	182.8	189.0	205.9	216.0	224.2	220.0	203.1	197.8	203.0	106.9**
Food products in the structure of retail trade, %											
The Russian Federation	46.6	48.6	48.5	47.7	46.6	47.0	47.0	48.7	48.6	48.4	1.8
Non-food products in the structure of retail trade, %											
The Russian Federation	53.4	51.4	51.5	52.3	53.4	53.0	53.0	51.3	51.4	51.6	-1.8

*The indicators are presented in comparable prices of 2017.
**Ratio, 2017 to 2008 , %
Compiled by: data from the websites www.gks.ru; www.fedstat.ru.

Table 4. Main indicators characterizing the population's living standards and the development of small business in the region

Block	N p.p.	Indicators
Level of small business development	X_1	Number of small business entities per 10 000 people, units / thousand people
	X_2	The share of employed population, working in the small business sector, %
	X_3	Turnover of one SB entity, mil. rubles
	X_4	The share of SB's fixed investment in comparison with the total volume, %
Level of the population's living standards	Y_1	The population's real money income per capita, rubles
	Y_2	Average monthly nominal accrued wages of employees in organizations, rubles
	Y_3	Fund ratio, times
	Y_4	Number of people with revenues below the minimum subsistence level (poverty level), %

Source: compiled by the authors

small business and the population's living standards in the region [26; 27], the system of indicators characterizing the economic categories under study has been elaborated (*Table 4*).

Certainly, the issue of using the assessment indicators system is controversial due to the problems of comparing the official data, their qualitative presentation, characterized by the integrated approach to the conducted research, etc. For example, V.A. Barinova, Head of Laboratory for Innovative Economics of the Ye.T. Gaidar Institute for Economic Policy notes the following: "... Due to various methods of collecting data by different responsible agencies, and owing to some difficulties in the working process of the recently designed Unified register, the statistical data on SMEs slightly vary" [28].

In our opinion, the transition of the Federal Tax Service to the Ministry of Economic Development of the Russian Federation from the beginning of 2017 could also influence the objectivity of the published information. At present, the State Duma has introduced the draft law designed to change the jurisdiction of the Federal State Statistics Service (the bill prepared by deputies of the parliamentary fraction "Fair Russia", which appeared in the database of the lower chamber on February 7). Thus, the authors of the legislative initiative consider the following: ... "the subordination of the Federal Statistical Agency to the Ministry responsible for economic development threatens the conflict of interests, and therefore leads to the decrease in objectivity of the data presented by Rosstat".

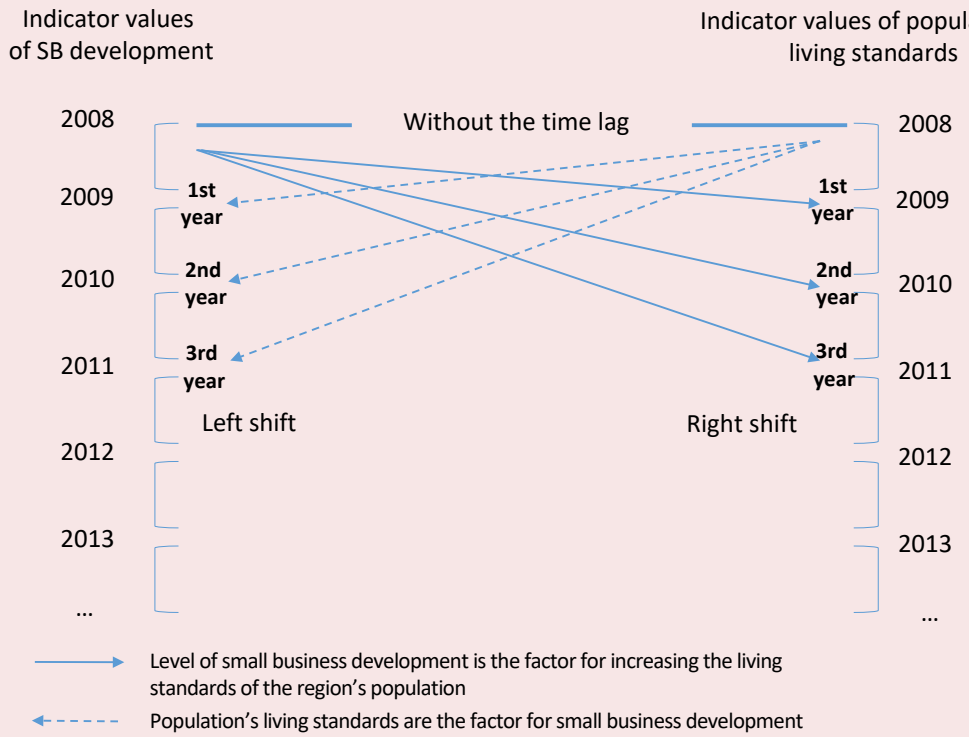
Therewith, it should be noted that the system of indicators has been composed taking into account the existing methodological approaches used by the scientific community for assessing the state of the small business sector and the population's living standards in the regions and by public administration bodies in the process of monitoring the effectiveness of developing these categories, and the availability of official statistical information [26; 27].

In order to evaluate the mutual influence between SB and the PLS the method of Almon has been used, which is based on pair correlation analysis of indicators taking into account the time lag (*Fig. 5*) [29].

The increase (decrease) of correlation index in the course of growing the time lag of one shift and its simultaneous decrease (increase) of another one indicates the presence of factor impact from the side having its greatest value in modulus. Thus, the performance of the specified conditions at the left shift of indicators will testify that the population's living standards are the factor of developing small business. At the right shift – the development of small business is the factor of improving the population's living standards in the region.

The study period is limited to the time interval 2008-2017 (the sample size comprises 800 observations). It is worth noting that according to the basic provisions of the central limit theorem, its distribution is considered normal, when the sample size is very large (for example, n > 100). Owing to the performance of the specified conditions, the pair correlation coefficient between the studied categories of indicators with the time lag up to three years has been calculated (*Table 5*).

Figure 5. The principle of comparing the indicators' values within the correlation analysis of the criteria of the population's living standards and the development of small business in the region with a time lag up to three years



Source: compiled by the authors based on [30].

Table 5. Correlation coefficient values between the indicators of the population's living standards and the development of small business in entities of the Russian Federation

Indicator	Y_1							Y_2						
	Without time lag	Left shift			Right shift			Without time lag	Left shift			Right shift		
		1 year	2 year	3 year	1 year	2 year	3 year		1 year	2 year	3 year	1 year	2 year	3 year
X_1	0.36	0.37	0.22	0.12	0.35	0.35	0.36	0.41	0.42	0.26	0.14	0.40	0.41	0.42
X_2	0.12	0.12	0.15	0.25	0.12	0.13	0.14	-0.08	-0.05	-0.02	0.09	-0.06	-0.05	-0.03
X_3	0.49	0.55	0.64	0.42	0.47	0.47	0.45	0.17	0.26	0.38	0.23	0.16	0.16	0.17
X_4	-0.46	-0.48	-0.46	-0.41	-0.47	-0.46	-0.46	-0.54	-0.55	-0.54	-0.46	-0.53	-0.54	-0.56
Indicator	Y_3							Y_4						
	Without time lag	Left shift			Right shift			Without time lag	Left shift			Right shift		
		1 year	2 year	3 year	1 year	2 year	3 year		1 year	2 year	3 year	1 year	2 year	3 year
X_1	0.23	0.17	0.07	0.16	0.23	0.25	0.26	-0.12	-0.05	0.06	-0.02	-0.06	-0.03	0.01
X_2	0.37	0.33	0.32	0.29	0.40	0.41	0.43	-0.35	-0.33	-0.24	-0.20	-0.36	-0.38	-0.40
X_3	0.67	0.67	0.71	0.45	0.65	0.64	0.64	-0.60	-0.52	-0.57	-0.36	-0.50	-0.44	-0.45
X_4	-0.38	-0.35	-0.29	-0.24	-0.36	-0.35	-0.40	0.10	0.16	0.15	0.17	0.16	0.27	0.31

Source: compiled by the authors using the software package "STATISTICA 10".

The results of the practical approval of the data from the Russian Federation's entities have confirmed the above-mentioned opinion of the scientific community that the population's revenues and the wage rate as a part of the population's living standards are the factor indicators influencing the distribution density of small business entities within the region and their development, in particular, the average turnover volume of one entity per share of SB fixed investment in the total volume. With further increase in the time lag, the conditions presented above stop executing, which indicates the medium-term showing of exerted influence.

However, along with it, the increase in the share of employed in the small business sector has a beneficial impact on the decrease in the number of people with revenues below the minimum subsistence level, but contributes to the increase in social differentiation. This fact testifies that the development of small business does not only help to solve one of the significant problems of the Russian economy (the growing poverty level of the population), but also leads to the increase in the average revenues of the well-off population category.

For interpretation of such interaction, the correlation-regression analysis of these indicators has been carried out, as a result of which the mathematical models of revealed dependencies based on the algorithm described in early works of one of the article's authors have been built [30]:

$$\begin{cases} X_1 = 0.002Y_2 + 253.54 + \varepsilon \\ Y_3 = 0.219X_2 + 9.59 + \varepsilon \\ Y_4 = -0.31X_2 + 20.9 + \varepsilon \end{cases}, \quad (1)$$

where X_1 – number of small business entities per 10 000 thousand people;

X_2 – the share of employed population, working in the small business sector;

Y_2 – average monthly nominal accrued wages of employees in organizations, rubles;

Y_3 – fund ratio, times;

Y_4 – number of people with revenues below the minimum subsistence level;

ε – unaccounted factors.

These models have been built taking into account their significance – those that did not comply with the conditions for conducting statistical analysis were excluded. Also, it should be noted that the first model included only one indicator due to multicollinearity between the indicators of real money income

per capita and the average monthly nominal accrued wages of employees in organizations. The value of F-criterion and its significance level *p* indicate that the built regressions are significant at significance level $\alpha = 0.05$ (*Table 6*). The Student's t-test of an intercept term and the equation's parameters confirm that.

Analyzing the graph of residuals and predicted values of the regression models has shown the relatively qualitative building of elaborated models, which also indicates their significance (*Fig. 6*).

These models cannot be used for building predicted values because the dependency between variables does not exceed 20%. Consequently, there are other factors that influence the change in the studied categories. However, in order to implement the integrated approach of public administration of the region's socio-economic system, the revealed interaction of the studied factors cannot help but be taken into account.

Summing up, the results of the conducted analysis have shown that the increase in the number of people employed in small business will lead to the reduction in the number of people with revenues below the minimum subsistence level, however, but this will have additional impact on the increase in social differentiation. The changes will contribute to the growth in the population's revenues, and consequently, to the increase in the number of small business entities owing to the growth of consumer demand. Based on the obtained data let us set some tasks for public administration in the field of SB and the PLS:

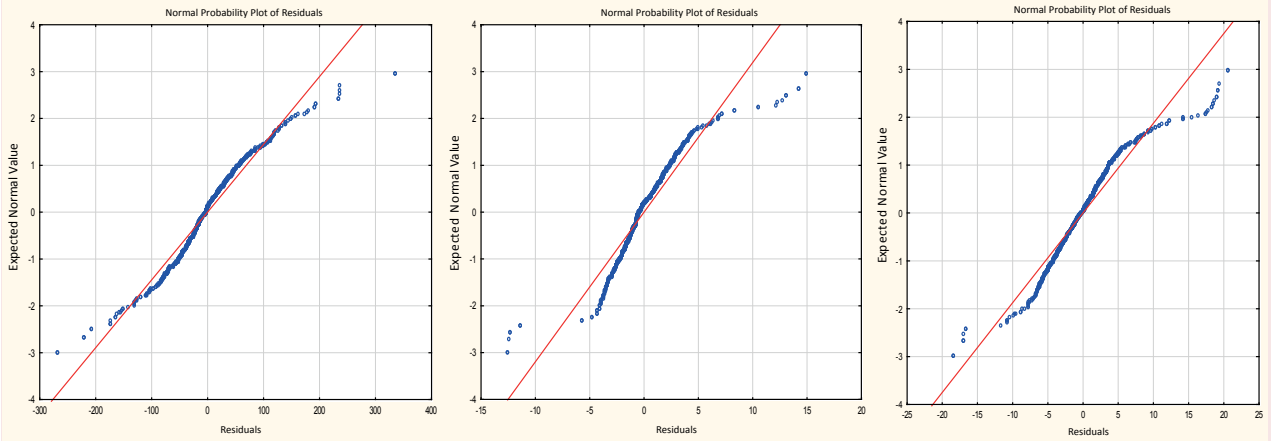
1. Implementation of measures for attracting the regions' population into business activities, which, as a result, will provide the reduction of unemployment and the increase in revenues of the population's certain categories. According to the results of previous studies, in order to do this it is necessary to modernize the existing support system for small and medium business at the regional and municipal levels. In particular, it seems appropriate to create financial instruments for managing the implementation of municipal development programmes through the formation of the "Regional fund for small business development". Its activity will be aimed at solving the issues related to insufficient funding of SB at the municipal level [31].

2. Stimulating consumer demand by creating conditions for the growth in revenues and the reduction of the population's expen-

Table 6. Describing the components of the regression models

N=800	b^0	Std.Err. of b^0	b	Std.Err. of b	t (798)	p-value
Regression Summary for Dependent Variable: X_1 R= 0,34035697 R?= 0,115842 Adjusted R?= 0,10268 F(1,798)= 55,784 p<0,00000 Std.Error of estimate: 67,374						
Intercept			253.5366	5.752739	4.07233	0.000000
Y_2	0.255612	0.034224	0.0020	0.000265	7.46887	0.000000
Regression Summary for Dependent Variable: Y_3 R= 0,42603521 R?= 0,181506 Adjusted R?= 0,176517 F(1,798)= 86,355 p<0,00000 Std.Error of estimate: 2,9383						
Intercept			9.591378	0.450899	7.27169	0.000000
X_2	0.312487	0.033627	0.218521	0.023515	9.29276	0.000000
Regression Summary for Dependent Variable: Y_4 R= 0,39251331 R?= 0,1540667 Adjusted R?= 0,14337766 F(1,798)= 86,355 p<0,00000 Std.Error of estimate: 2,9383						
Intercept			20.91343	0.788008	6.53961	0.000000
X_2	-0.254067	0.034238	-0.30496	0.041096	-7.42060	0.000000
Source: compiled by the authors using the software package "STATISTICA 10."						

Figure 6. The graph of residuals and predicted values of the regression models of studied indicators



Source: compiled by the authors using the software package "STATISTICA 10".

ditures in the region. In order to do this the federal authorities should resume the funding of regional expenditure subsidy systems in SB entities (refund of credit interest, lease payments, acquiring equipment, etc.) in priority activity areas of each region of the Russian Federation aiming to reduce the cost value and total price of manufactured products. These measures will allow to reduce and differentiate the population's expenditures, providing the increase in consumer demand in general.

The specified measures of public administration and the implementation of certain actions on the territory the Russian Federation's entities will provide the development of the small business sector, activating of which will contribute to the increase of the population's living standards in the regions in total.

Conclusions and suggestions

Based on the results of the conducted research, the following conclusion has been made: in the process of managing the small business sector's development and in order to improve the population's living standards the regional authorities need to focus their attention and resources on increasing the number of workers engaged in the activities of the sector under study. The change in this parameter in the socio-economic system of the region will allow reducing the poverty level and providing the increase in revenues of the population's certain categories, which therefore will contribute to the consumption growth and the formation of new business entities.

It should be noted that according to the passport of the national project "Small and medium business and support for individual entrepreneurial initiative" the federal authorities have set a goal by 2024 to increase the number of employed in the economic sector under study almost by 25%. However, the experience of previous studies has shown that such growth can be achieved only with concerted efforts between all levels of the government and joint cooperation of various public organizations operating within the local territory. Therewith, the major load regarding the development of small business falls on the local government authorities.

Unfortunately, the recent reforms in the Russian Federation have led to centralization of the existing measures for SB support at the level of federal authorities and subordinate institutions. From our point of view, this

situation has a negative impact on achieving the stated goals that is why the problem of developing a system of measures for stimulating the development processes in the studied economic sector in the regions remains relevant at the moment. The further work of the authors' team will be aimed at its solving. The materials of the article can be used by the federal and regional government bodies and administrative authorities to determine further measures for implementing the strategy for the development of the region's economy.

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Public Opinion Monitoring of the State of the Russian Society

As in the previous issues, we publish the results of the monitoring of public opinion concerning the state of the Russian society conducted by VolRC RAS in the Vologda Oblast[1].

We would like to pay your attention to the fact that, due to quarantine activities in the Vologda Oblast, VolRC RAS temporarily suspends conducting surveys of the region's population using questionnaires in places of respondents' residence.

It impacted the content of this material. The article includes the results of public opinion monitoring conducted by largest Russian centers (Russian Public Opinion Research Center (VCIOM) and Levada-Center) on such relevant topics as the approval of the President's work, the dynamics of Russians' political preferences, self-estimation of the financial well-being and prospects of its development, population's social well-being

For comparison[2], the dynamics of public opinion monitoring conducted by VolRC RAS in the Vologda Oblast is given without data for April 2020. The results of research for April 2019 – February 2020 and average annual data for the last 3 years (2017–2019) are shown.

The assessment of the RF President's work

According to data of public opinion monitoring conducted by VolRC RAS in the Vologda Oblast, in December 2019 – February 2020, the level of approval of the work of the President of the Russian Federation did not change significantly: the share of positive assessments was 54%, the share of negative judgements was 31%.

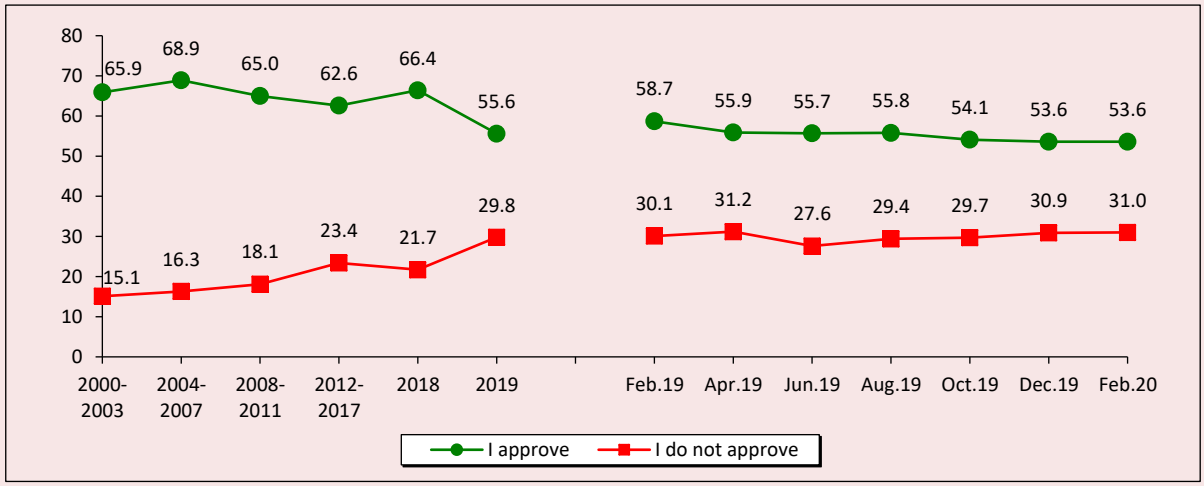
In general, the share of positive assessments of the President's work in early 2020 is slightly lower than in February 2019 (59%) and below average numbers for 2019 (56%).

[1] The polls are held six times a year in Vologda, Cherepovets, and in eight districts of the oblast (Babayevsky District, Velikoustyugsky District, Vozhegodsky District, Gryazovetsky District, Kirillovsky District, Nikolsky District, Tarnogsky District and Sheksninsky District). The method of the survey is a questionnaire poll by place of residence of respondents. The volume of a sample population is 1,500 people 18 years of age and older. The sample is purposeful and quoted. The representativeness of the sample is ensured by the observance of the proportions between the urban and rural population, the proportions between the inhabitants of settlements of various types (rural communities, small and medium-sized cities), age and sex structure of the Oblast's adult population. Sampling error does not exceed 3%.

More information on the results of VolRC RAS polls is available at: http:// www.vscc.ac.ru/

[2] It should be noted that different statistical approaches of VCIOM, Levada-Center, and VolRC RAS do not allow comparing acquired results. Nevertheless, the collected data makes it possible to analyze the overall dynamics of social attitudes existing in Russian society and recorded by three different research centers (two Russian and one regional).

In general, do you approve or disapprove of the work of the President of Russia? (% of respondents)



Source: data of VolRC RAS.

At the beginning of 2020, various research centers record contradictory trends in the assessment of the President's work by Russian people.

According to VCIOM, since December 2019, there has been a positive dynamic: in December 2019, the level of approval of the work of President was 63%, in February 2020 – 65%, in April – 69%.

According to Levada-Center, from December 2019 to March 2020, the share of positive judgments on the work of the President decreased by 5 p.p. (from 68 to 63%).

The results of surveys conducted by VolRC RAS in the Vologda Oblast show that the level of approval of the President's work has remained stable (54% since October 2019).

How do you assess the current performance of the RF president? (% of respondents)

Answer	2017	2018	2019	Apr. 2019	June 2019	Aug. 2019	Oct. 2019	Dec. 2019	Feb. 2020	Apr. 2020	Dynamics (+/-), Apr. 2020 to…	
											Feb. 2020	Apr. 2019
Assessment of the President's work according to VCIOM												
I approve	83.5	71.0	64.1	65.2	64.2	63.1	66.0	63.0	65.2	68.6	+3	+3
I do not approve	10.3	20.1	27.2	26.4	27.5	28.0	25.6	28.2	25.9	22.4	-4	-4
Assessment of the President's work according to Levada-Center												
I approve	82.2	73.3	66.8	66	68	67	70	68	69	63*	-6	-3
I do not approve	16.8	25.7	31.9	33	31	31	29	31	30	36*	+6	+3
Assessment of the President's work according to VolRC RAS												
I approve	67.3	66.4	55.6	55.9	55.7	55.8	54.1	53.6	53.6	н.д.	–	–
I do not approve	20.0	21.7	29.8	31.2	27.6	29.4	29.7	30.9	31.0	н.д.	–	–

Sources: Database of VCIOM. Available at: https://wciom.ru/news/ratings/odobrenie_deyatelnosti_gosudarstvennyx_institutov/; Database of Levada-Center. Available at: https://www.levada.ru/indikatory/; data of VolRC RAS.
*Data for March 2020.

Political preferences of population

In general, the level of support for the United Russia party slightly increased across the country (VCIOM data). Currently, it is 35% which is approximately corresponds to the average annual estimates for 2019 and April 2019 data.

Support for other parliamentary parties in February – April 2020 did not change significantly.

It should also be noted that, since the beginning of the year, the share of Russians who found it difficult to answer the question "What party would you vote for if the elections were to happen next Sunday?" has increased slightly (by 4 p.p., from 13 to 17%). It is possible that, in the first months of 2020, the issue of political preferences is not so important for people (in comparison, in particular, with the assessment of activities of state authorities and development of the economic situation on the background of quarantine activities during the coronavirus epidemic).

Dynamics of political preferences in the country in general
(% of respondents)

Answer	2017	2018	2019	Apr. 2019	June 2019	Aug. 2019	Oct. 2019	Dec. 2019	Feb. 2020	Apr. 2020	Dynamics (+/-), Apr. 2020 to…	
											Feb. 2020	Apr. 2019
United Russia	50.4	40.0	33.5	34.8	34.0	32.6	33.6	32.6	33.0	35.2	+2	0
KPRF	11.4	14.2	15.3	15.7	15.1	15.2	15.5	15.2	14.7	13.0	-2	-3
LDPR	9.5	10.4	12.4	12.1	12.2	12.6	12.4	12.6	11.9	10.0	-2	-2
Just Russia	5.1	5.5	6.0	6.2	6.1	5.7	6.1	5.8	6.2	5.8	0	0
Non-parliamentary parties	5.7	7.9	9.6	6.0	9.9	10.5	10.8	10.8	11.1	9.9	-1	+4
"I will come and spoil a bulletin", "I would not participate in the elections".	6.5	9.5	9.9	9.2	9.9	10.0	10.0	10.5	10.2	9.8	0	+1
I hesitate to answer	11.2	12.7	12.7	12.7	12.9	13.6	11.8	12.7	13.3	16.5	+3	+4

Question wording: "Would you please say what party would you more likely to vote for if the State Duma elections were to happen next Sunday?" Options: "The United Russia, KPRF, LDPR, "Just Russia", "non-parliamentary parties", "I will come and spoil a bulletin", "I hesitate to answer", "I would not participate in the elections".
Source: Database of VCIOM. Available at: https://wciom.ru/index.php?id=236&uid=10238

There are no significant changes in the structure of political preferences of residents of the Vologda Oblast. The level of support for the United Russia party is stable – 33–34%, LDPR and KPRF – 8–9%, and Just Russia – 4–5%.

As in last February and on average in 2019, the share of people who believe that none of the political forces represented in Parliament expresses their interests is 34%, which is much higher than in 2017–2018 (29%).

Dynamics of political preferences in the Vologda Oblast
(% of respondents)

Party	2007	2011	Election to the RF State Duma 2011, fact	2012	2016	Election to the RF State Duma 2016, fact	2017	2018	2019	Feb. 2019	Apr. 2019	June 2019	Aug. 2019	Oct. 2019	Dec. 2019	Feb. 2020	Dynamics (+/-), Feb. 20 to…	
																	Dec. 2019	Feb. 2019
United Russia	30.2	31.1	33.4	29.1	35.4	38.0	34.7	37.9	33.8	34.6	33.3	34.8	33.5	32.8	33.7	33.2	-1	-1
KPRF	7.0	10.3	16.8	10.6	8.3	14.2	7.6	9.2	8.8	9.1	8.0	8.5	8.7	9.1	9.2	8.9	0	0
LDPR	7.5	7.8	15.4	7.8	10.4	21.9	11.0	9.6	9.1	8.9	8.2	9.1	10.5	8.3	9.4	9.9	+1	+1
Just Russia	7.8	5.6	27.2	6.6	4.2	10.8	4.8	2.9	3.4	2.9	2.9	2.5	3.9	4.2	4.0	4.7	+1	+2
Other	1.8	1.9	–	2.1	0.3	–	0.5	0.7	0.3	0.6	0.3	0.3	0.4	0.1	0.1	0.6	+1	0
None	17.8	29.4	–	31.3	29.4	–	29.2	28.5	33.7	34.2	34.7	32.3	32.1	34.3	34.3	34.0	0	0
I hesitate to answer	21.2	13.2	–	11.7	12.0	–	12.2	11.2	11.0	9.7	12.6	12.4	10.9	11.2	9.3	8.7	-1	-1

Question wording: “Which party expresses your interests?”.
Source: data of VoIRC RAS.

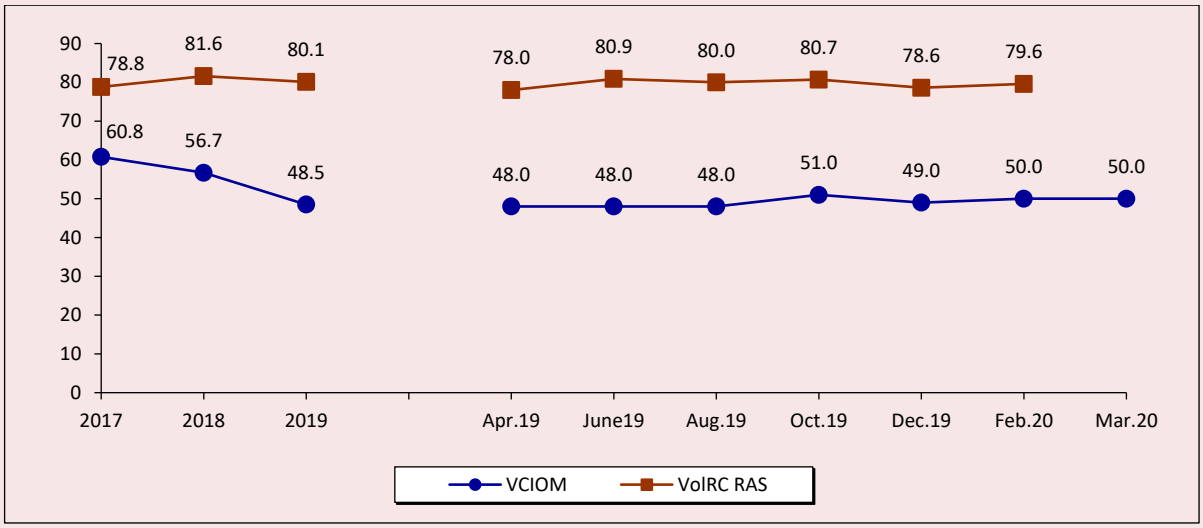
Self-estimation of the financial well-being

According to Russian (VCIOM) and regional (VolRC RAS) studies, the Russians' estimation of the financial well-being remains stable at the beginning of 2020.

According to VCIOM, the index of financial well-being assessment in February – March 2020 was 50 p. which is approximately equal to average value of the index for 2019 (49 p.), and it is slightly higher than in April 2019 (48 p.).

According to VolRC RAS, the index of financial well-being assessment at the beginning of 2020 was 79 p. which is also equal to average indicator for 2019 (80 p.), and it is slightly higher than in April 2019 (78 p.).

Index of financial well-being assessment[3]



Question wording: "How would you currently assess the financial well-being of your family?".

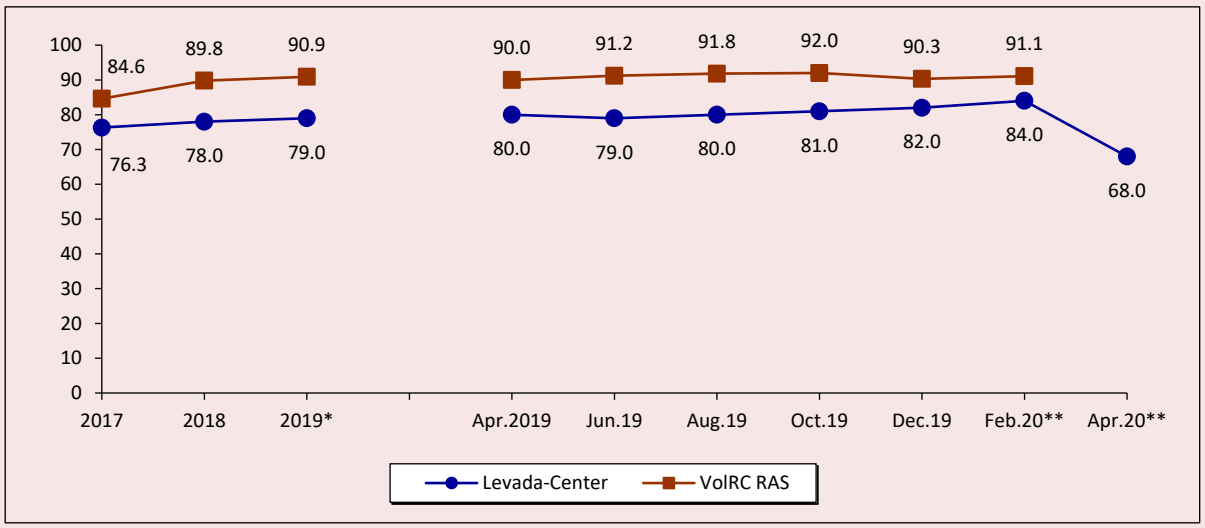
Sources: Database of VCIOM. Available at: https://wciom.ru/news/ratings/indeksy_socialnogo_samochuvstviya/; data of VolRC RAS.

[3] VCIOM index of financial well-being is calculated as the difference between the sum of positive and average assessments and the sum of negative ones.

The index of financial well-being is calculated by VolRC RAS by subtracting the share of negative responds from the share of positive, and then 100 is added to the resulting value to avoid negative values.

Consumer Sentiment Index (CSI) which characterized expectations of people regarding development of their financial situation in the future has significantly decreased across the country (from 84 to 68 p. – Levada-Center data). It is much lower than the average number for 2019 (79 p.) and for April 2019 (80 p.). Apparently, the noticeable drop of CSI in April 2020 is a consequence of the deterioration of the current and uncertain future socio-economic situation due to forced quarantine activities introduced to counter the spread of viral infection.

Consumer Sentiment Index (CSI)



*Data of Levada-Center for January, March, May, July, September, November 2019.

**Data of Levada-Center for January 2020 and March 2020.

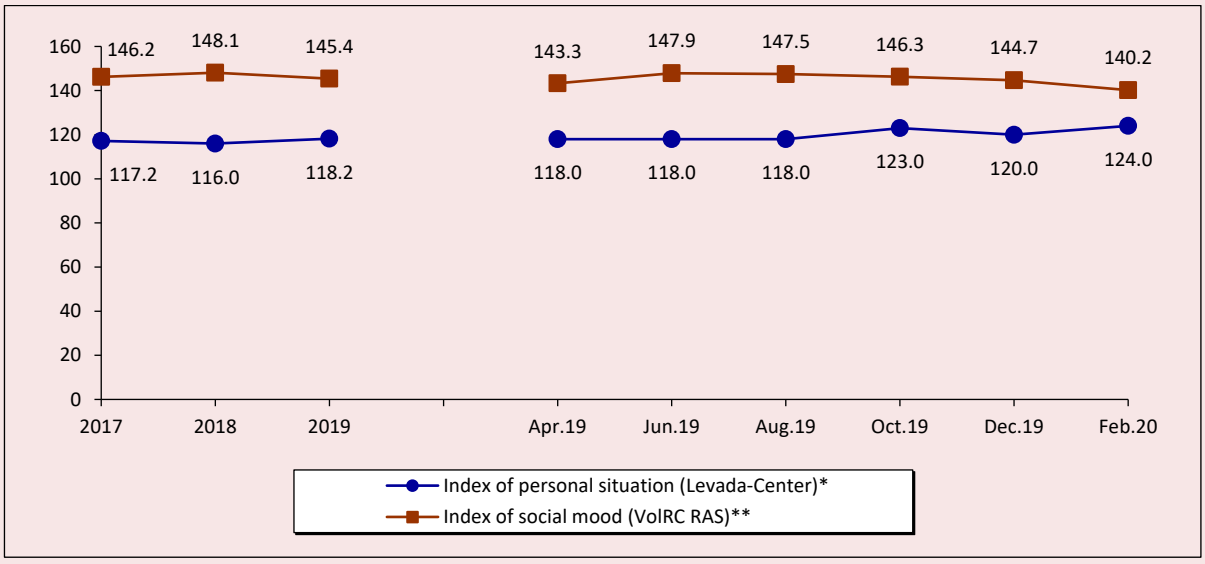
Source: Database of VCIOM. Available at: https://wciom.ru/news/ratings/indeksy_socialnogo_samochuvstviya/; data of VolRC RAS.

Assessment of social well-being

In general, across the country, the index of personal situation, measured by specialists of Levada-Center, for December 2019 – February 2020 increased by 4 points (from 120 to 124 p.).

According to regional studies of VolRC RAS, since August 2019, there has been the worsening of social mood among residents of the Vologda Oblast: in general, in August 2019 – February 2020, the index of social well-being in the region decreased by 8 points (from 148 to 140 p.), and it decreased by 5 points (from 145 to 140 p.) during two last surveys.

Dynamics of indices of social well-being (in points)



* Levada-Center's index of personal situation is calculated according to two questions: "What could you say about your mood over the last few days?" and "Is your life and the life of your family has improved, deteriorated, or did not changed in the last year?". To calculate the index, the share of positive responses is subtracted from the share of negative ones, and then 100 is added to the resulting value to avoid negative values.

** The index of social mood is calculated by VolRC RAS using the question "What could you say about your mood over the last few days?". To calculate the index, the share of positive responses is subtracted from the share of negative ones, and then 100 is added to the resulting value to avoid negative values.

Sources Database of Levada-Center. Available at: https://www.levada.ru/indikatory/sotsialno-ekonomicheskie-indikatory/; data of VolRC RAS.

Conclusion

At the beginning of 2020, data of various centers conducting public opinion monitoring show rather contradictory trends. It, first of all, applies to assessments of the RF President's work and social well-being of population.

Different dynamics of data is mainly related to methodological nuances of sociological surveys conducted by VCIOM, Levada-Center, and VolRC RAS. However, it also partly reflects the nature of the situation in the country at the beginning of 2020.

The President's initiatives to amend the text of the Constitution of the Russian Federation have a positive impact on the psychological state of people and the level of his support. We would like to remind that around 50% of Russians (according to VCIOM) support amendments to the Main Law, and the share of those who support this opinion continues to grow: in the February wave of the survey, the share of Russians who would vote for amendments to the Constitution was 43%, in March – 46%, in April – 50%[4].

An equally important positive factor is the decision to include V.V. Tereshkova's proposal to "nullify" V. Putin's presidential terms, if these changes to the Main Law are supported during the all-Russian referendum, in the general pack of amendments to the Constitution[5]. This initiative of the State Duma deputy helped to reduce some social disturbance related to the development of the political situation in the country after 2024, when V. Putin (in accordance with the text of the 1993 Constitution) would no longer be able to run for the post of the head of the state. According to experts, the "Tereshkova's amendment" responded to concerns of the majority. It opened the possibility for the current President to run for office again, and it changed the perspective of political life until 2024… There is a real guarantee that the constitutional reform in the format proposed by V. Putin will actually be implemented. Polls show that it is highly supported by the public[6]. Thus, according to VCIOM, at the end of March, 57% of Russians supported the removal of restrictions for the former, or current, President of the Russian Federation to participate in the next Presidential election as a candidate (for comparison, 33% of respondents supported the opposite point of view)[7].

Another factor that has a positive impact on people's psychological well-being and support for the President's activities is the public's assessment of measures taken by Russian authorities to prevent the spread of the coronavirus epidemic. According to VCIOM, from March 19 to April 2, the share of Russians who believe that Russian authorities take "sufficient" measures to prevent the spread of the infection in the country increased from 56 to 63%[8].

Nevertheless, the epidemiological situation in the country and in the world, as well as the economic situation, which is largely determined by the degree and duration of quarantine activities in various regions of Russia, cause concerns of general population. It, in particular, explains the

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[4] *A vote for amendments to the Constitution: The first forecast.* VCIOM analytical review no. 4217, dated 22.04.2020. Available at: https://wciom.ru/index.php?id=236&uid=10246

[5] We would like to remind that it was proposed by V.V. Tereshkova on March 10 during the meeting of the State Duma. On March 14, the amendment was included in the Main Law "On improving the regulation of certain issues of the organization and functioning of public authority". On March 16, it was approved by the Constitutional court of the Russian Federation (see Conclusion of the Constitutional court of the RF on the compliance with provisions of chapters 1, 2, and 9 of the Constitution of the Russian Federation of provisions of the Law of the Russian Federation on amendments to the Constitution of the Russian Federation "On improving the regulation of certain issues of the organization and functioning of public authority" that have not come into force, and the compliance with the RF Constitution of the procedure for entry into force of article 1 of this Law in relation to the request of the President of the Russian Federation. Available at: http://doc.ksrf.ru/decision/KSRFDecision459904.pdf)

[6] Skorobogatyi P. Putin creates a "deep state" in Russia (materials of an interview with political scientist, teacher of MGIMO MFA of the RF A. Zudin). *Expert*, 23.03.2020, no. 13, p. 43.

[7] *Social and political amendments: Ranking of Russians' preferences.* VCIOM analytical review no.4200, dated 31.03.2020. Available at: https://wciom.ru/index.php?id=236&uid=10215

[8] Sources: *And again on the coronavirus: What do Russians think?* VCIOM press-issue no. 4194, dated 18.03.2020. Available at: https://wciom.ru/index.php?id=236&uid=10205; *Russia in the pandemic: Assessing the efficiency of anti-epidemic measures.* VCIOM press-issue no. 4206, dated 08.04.2020. Available at: https://wciom.ru/index.php?id=236&uid=10224

sharp decline of the Consumer Sentiment Index (from 84 to 68 p. in January–March 2020 – data of Levada-Center), which reflects people's forecast expectations regarding the prospects of the development of their personal financial situation and the economic situation in the country.

Thus, the current situation may be called a force majeure, and, in this sense, it is worth noting the timeliness of the President's initiative to amend the Constitution of the Russian Federation, which he announced on January 15, 2020 in his annual Address to the Federal Assembly[9]. As always, by acting ahead of the curve, the head of the state managed to reduce socio-political tensions in the country. It is an especially important moment within the epidemiological and socio-economic crisis.

The future nature of public mood will depend mainly on two factors: the dynamics of the spread of the coronavirus infection and the efficiency of measures taken by the President and Government to maintain standards of living of general population, to prevent mass unemployment, to support businesses, and to build up the capacity of the health system.

The materials were prepared by M.V. Morev, E.E. Leonidova.

[9] Presidential Adress to the Federal Assembly, January 15, 2020. *Official website of the President of Russia*. Available at: http://www.kremlin.ru/events/president/news/62582

AUTHOR GUIDELINES
for Submission of Manuscripts to the Editor of the Scientific Journal
Economic and Social Changes: Facts, Trends, Forecast

The Journal publishes original theoretical and experimental articles that fall within the scope of the journal. The manuscript should be of no less than 16 pages (30,000 characters with spaces). The maximum length of the paper submitted to publication is 25 pages (approximately 50,000 characters with spaces). Book reviews, information on scientific conferences, scientific chronicles are also submitted to publication. The papers should contain research findings of completed and methodologically proper works.

The decision for publication is made by the Journal's Editorial Staff on the basis of the reviewer's report. The novelty, scientific importance and relevance of submitted material are also taken into consideration. Articles rejected by the Editorial Staff will not be reconsidered.

Requirements to the package of materials submitted

The following materials are submitted to the editorial office in electronic form:

1. A file containing the article in a Microsoft Word document, format .docx. The name of the file is typed in the Roman characters and reflects the author's last name (e.g.: Ivanova.docx).
2. Full information about the author on a separate page: full name, academic degree and title, place of work and position, contact information (postal address, telephone, e-mail – if available), ORCID, Researcher ID. The information should be arranged in a table.
3. Scanned copy of the commitment of the author not to publish the article in other publications.
4. A color photo of the author in the .jpeg / .jpg format of no less than 1 MB.

The package of materials is to be sent to the editor's email address: esc@volnc.ru.

Text design requirements

1. Margins

Right – 1 cm, others – 2 cm.

2. Font

Font size of the article's text – 14, type – Times New Roman (in case a special type font is needed, when typing Greek, Arab, etc. words, Windows default fonts are to be used). In case the paper contains seldom used fonts, they (font family) are to be submitted along with the file. Line interval – 1,5.

3. Indent – 1.25. Made automatically in MS Word.

4. Numbering

Page numbers are placed in the lower right corner of the page automatically with the use of MS Word tools.

5. First page of the article

In the upper right corner, the UDC is placed, under it, after the 1.5 spacing – the LBC, then – the symbol ©, indent (spacing), and the name and initials of the author in semi-bold. After the 2-spacing indent, the title of the article is given. Central alignment is used for the title of the article given in semi-bold. The abstract and key words are given below, after the 2-spacing indent, without a paragraph indent, in italics and aligned by width. Then, after the 2-spacing indent, the text of the article is placed.

6. Abstract

The abstract contains from 200 to 250 words. The abstract states the purpose of the research, points out its undoubted scientific novelty and its differences from similar works of other scientists; contains the methods used by the author and the main results of the work performed; identifies areas of application of the results of the study; briefly formulates the prospects for further research in this area.

Examples of good abstracts for different types of articles (reviews, scientific articles, conceptual articles, application articles) are available at: http://www.emeraldinsight.com/authors/guides/write/abstracts.htm?part=2&PHPSESSID=hdac5rtkb73ae013ofk4g8nrv1.

7. Key words

There should be not more than eight words or word combinations. Key words should reflect the content of the manuscript to the fullest extent. The number of words within a phrase should not exceed three.

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The caption of the table and its number (if present) are given in normal font, without highlighting. The caption runs in bold and is center aligned.

Tables are inserted; drawing tools and AutoShapes are not allowed; column and cell alignment using spaces or tabs is not allowed. MS WORD table editor is used for tables. Each piece of data of the stub and head of the table correspond to discrete cell. Only editor standard tools are applied for creating and formatting tables, no pilcrows, spaces and extra blank lines for semantic breakdown and line adjustment are allowed.

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Write: either "Source", or "Compiled with the use of", or "Calculated with the use of", etc., after that – information about the source.

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The word "References" is given after a 1.5 spacing after the body of the article in lower-case letters, semi-bold italics, center alignment. Then, the list of references is given after the 1.5 spacing.

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[1] Information about the modified Harvard standard is given in the book: Kirillova O.V. *Redaktsionnaya podgotovka nauchnykh zhurnalov po mezhdunarodnym standartam: rekomendatsii eksperta BD Scopus* [Editorial Preparation of Scientific Journals according to International Standards: Recommendations of a Scopus Expert]. Moscow, 2013. Part 1. 90 p.

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